Technology-Enabled Value Co-Creation in Business Networks - The Impact on Innovativeness

Doctor of Philosophy Thesis

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Declaration

I confirm the work submitted is entirely my own and have fully referenced my sources as appropriate.

Some parts of this thesis have been submitted to and presented at academic events and conferences:

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Executive Summary

Globalisation and advances in information and communication technologies have created a new avenue for collaborative processes and increased the digital content of innovation. Increasingly, businesses are realising the benefits of harnessing stakeholders' capabilities, competences and resources in order to build superior competitive advantage through enhancing innovativeness. In essence, an increasing body of strategic management and marketing scholars suggest that organisations require the ability to attract stakeholders with critical resources and engage in collaborative relationships with them in order to co-create value.

However, very little is known about how the various sets of actors in business networks engage in the value co-creation process, specifically one that is technology-enabled. Furthermore, the literature on the dynamic capability view of the firm acknowledges that networking capability enables actors to occupy a position that is more embedded in the business network. In effect, the number of relationships involving individual actors shows that they occupy a central position. Therefore, there is a need to establish the effect of network position on actors' ability to apply their capabilities to build inter-organisational relationships through which they have access to relevant resources and information in business networks. In essence, neglecting the role of actors' embeddedness not only limits the extent of the understanding of the factors affecting resource integration and the value co-creation process among actors in the business network, but will also lead to endogeneity bias.

The aim of this research, therefore, is to provide a holistic conceptual framework to examine the technology-enabled value co-creation process in a business network context. The framework encompasses networking capability as an antecedent of the value co-creation process and firm innovativeness as a value-based outcome, while considering the moderating role of network structure in fostering the relationship between networking capability and actors` ability to access embedded resources in the network.

Applying the building blocks of interactions, i.e., the DART model, the research examines how value is co-created in business networks through the integration of operant resources using collaborative technology for innovation. It is worth distinguishing here between operant and operand resources; the latter are typically physical (tangible) (e.g., raw material and finished goods) that act on other resources, for example requiring the application of other resources to generate their potential value (Madhavaram and Hunt, 2008). On the other hand, operant resources are intangible and typically reside in different sources such as the organisational (e.g., procedures, routines, competences and capabilities); human (e.g., skills, knowledge and expertise); relational (e.g., relationships with the various actors in the business network); and

informational (e.g., knowledge about customers, technology, competitors and new market segments) (Vargo and Lusch, 2004; Madhavaram and Hunt, 2008). Further, the research aims to explore the moderation effects of the organisation's network position in the relationship between networking capability and access to information and resources, as one of the components of the DART model. The aim is also to contribute to the service-dominant logic literature, especially to the performance implications of the value co-creation process that is technologically enabled in a business network context.

In order to achieve the aims and test the hypotheses, the philosophical assumptions of the critical paradigm are relevant to this research. In particular, the research adopts a multi-method quantitative research design consisting first of convergent-based structural equation modeling employed, using the maximum likelihood algorithm in the IBM AMOS 25 software package in order to examine networking capability as an antecedent to the value co-creation process. Further, an evaluation was made of the impact of the value co-creation process on enhancing innovativeness and on testing our moderation variables. Second, the research employed the social network analysis in the Gephi 0.9.2 and UCINET 6.0 software packages, guided by the 'nominalist approach' of setting boundaries of the business network in order to understand and map the business network configuration (e.g., interactions, communications and resource sharing). The analysis extracted the network position parameters to test the moderation hypotheses.

The findings reveal that networking capability positively and significantly affects the DART model components, and that the model positively and significantly affects firm innovativeness. In-degree centrality strengthens the positive association between networking capability and access to resources, while closeness centrality has no significant effect.

The research contributes to a better understanding of the value co-creation process in a business network context. In particular, it contributes to the development of the service-dominant logic perspective by expanding the use of the DART model in a business network context and determining the role of the technology-enabled value co-creation process in enhancing firm innovativeness. It also contributes to the mainstream research on social networks by investigating the effect of actors' embeddedness on the value co-creation process. The findings of the research are also relevant for marketing managers and practitioners, by proposing an overarching framework for the successful implementation of the value co-creation process that is mediated by a digital engagement platform in order to leverage innovativeness, consequently enhancing organisational competitiveness.

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Initialisations

2SLS	Two-Stage Least Squares
A2A	Actor-to-Actor
AI	Artificial Intelligence
ANT	Actor-Network Theory
B2B	Business-to-Business
B2C	Business-to-Customer
CB-SEM	Covariance-Based Structural Equation Modeling
CCD	Companies Control Department
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CLF	Common Latent Factor
CLV	Customer Lifetime Value
CMB	Common Method Bias
CMO	Chief Marketing Officer
CMV	Common Method Variance
CRM	Customer Relationship Management
DART	Dialogue; Access; Risk-benefits; Transparency
DCV	Dynamic Capability View
df	Degrees of Freedom
DIP	Digitalised Interactive Platform
DV	Dependant Variable
ECVI	Expected Cross-Validation Index
EFA	Exploratory Factor Analysis
F2F	Face-to-Face
FMCG	Fast-Moving Consumer Goods
FPs	Foundational Premises
G-D	Goods-Dominant
GFI	Goodness of Fit Index
ICT	Information and Communications Technology
IFI	Incremental Fit Index
IMP	Industrial Marketing and Purchasing
IoT	Internet of Things
IS	Information Systems
IT	Information Technology
IV	Independent Variable
KMO	Kaiser-Meyer-Olkin measure of sampling adequacy
MENA	Middle East and North Africa
ML	Maximum Likelihood
MNCs	Multinational Companies

NGOs	Non-Governmental Organisations
NPD	New Product Development
NSD	New Service Development
PCA	Principal Component Analysis
PLS-SEM	Partial Least Squares Structural Equation Modeling
R&D	Research and Development
R-A	Resource-Advantage
RBV	Resource-Based View
RMSEA	Root Mean Square Error of Approximation
RQ	Research Question
RV	Relational View
SBUs	Strategic Business Units
S-D	Service-Dominant
SEM	Structural Equation Modeling
SMEs	Small and Medium size Enterprises
SNA	Social Network Analysis
SRMR	Standardised Root Mean Residual
STEM	Science, Technology, Engineering and Maths
SWT	Strength of Weak Ties
TLI	Tucker Lewis Index
VIF	Variance Inflation factor

Symbols

α	Cronbach`s Alpha coefficients
β	Beta coefficient
X^2	Chi-square
$\Delta \chi^2$	Chi-square difference test
X^2 /df	Chi-square to degrees of freedom ratio

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Chapter 1. Introduction

1.1 Background and motivation for research

Advances in information and communications technologies (ICTs) have led to increasing competition and offered new opportunities for innovation (Barrett *et al.*, 2015; Bogers, Chesbrough and Moedas, 2018). In particular, ICTs have prompted the development and adaption of digital engagement platforms by organisations to facilitate resource sharing and integration in order to cope with technological developments and the rapid changes in the markets, which in turn allows them to maintain their relevance. Digital engagement platforms represent *"virtual touchpoints designed to provide structural support for the exchange and integration of resources between actors in a service system"* (Breidbach and Maglio, 2016, p. 83). Organisations such as Toyota (Toyota, 2017), Hitachi (Hitachi, no date), Apple, Starbucks and Nike (Ramaswamy and Ozcan, 2016, 2018a) use digital engagement platforms to share and integrate resources with their stakeholders for product and service (i.e., value propositions) creation and development, known as value co-creation. Value co-creation is defined as a synergistic process in which actors perform resource integration activities through interactions with each other and which result in mutual benefits, such as improved innovations and enhanced firm performance (Vargo and Lusch, 2011; Ramaswamy and Ozcan, 2018b).

It is worth noting here that Vargo, Maglio and Akaka (2008, p. 146) acknowledge that *"value is an elusive term"*. Hence, what constitutes 'value' is interpreted from each individual's or organisation's perspective in their particular context, which Gummesson and Mele (2010), Chandler and Vargo (2011) and Vargo, Akaka and Vaughan (2017) refer to as 'value-in-context'. Further, Grönroos and Voima (2013, p. 135) note that *"value creation is never explicitly defined"*. Gummesson and Mele (2010, p.187), citing Lusch, Vargo and Wessels (2008), argue that value creation occurs *"when a potential resource is turned into a specific benefit"*. Therefore, the term 'value' in the value co-creation concept in this research denotes the value-in-context, and value creation is the process of converting resources into value.

The mainstream research on value co-creation is underpinned by the service-dominant (S-D) logic perspective, which is an all-encompassing theory for analysing economic exchanges (Vargo and Lusch, 2004). S-D logic suggests *"a conceptualization of service innovation—based on the application of ''competences'' (i.e., knowledge and skills) —that is not rooted in the traditional manufacturing-services dichotomy"* (Ordanini and Parasuraman, 2011, p. 3). S-D logic is at the stage of mid-range theory in marketing, aiming for development into a grand theory (Vargo and Lusch, 2017).

Prahalad and Ramaswamy (2004, p. 9) propose the *"building blocks of interactions: dialogue, access, risk-benefits, and transparency (DART)"* model between organisations and customers in order to facilitate the value co-creation experience in digital interfaces. Prahalad and Ramaswamy (2004) argue that organisations and customers access resources and integrate them through digitally-enabled interactions. Accordingly, the digital engagement platform should facilitate four key components. First, dialogue; the ability and willingness to interact and engage on both sides of the relationship. Second, access; the ability of customers to access crucial information about the value propositions. Third, risk/benefit assessment; the ability of customers to assess the potential risks and benefits associated with the value propositions. Finally, transparency, which represents the openness and information asymmetry between the organisation and its customers (Prahalad and Ramaswamy, 2004). Scholars such as Hein *et al.* (2019) and Mele, Polese and Gummesson (2019), among others, (e.g., Breidbach and Maglio, 2016; Vargo, 2018), assert that there is a need to investigate how the value co-creation process occurs across such virtual environments. Understanding the technology-enabled value co-creation process will allow scholars and practitioners to develop a deeper comprehension of how actors regulate and control the various operant resources embedded within their business network, resulting in faster, more effective, and economical resource integration (Lusch and Nambisan, 2015; Ramaswamy and Ozcan, 2018a).

A business network is a group of individuals, organisations and other stakeholders working together based on common strategic objectives (Kohtamäki and Rajala, 2016; Vargo and Lusch, 2016; Ng and Vargo, 2018). However, according to the review (Chapter 2: Literature Review) made of the value co-creation literature, the discussion on the technology-enabled value co-creation process, remains largely conceptual (for recent meta-analyses see Amorim Lopes and Alves, 2020 and Li *et al.*, 2020), and only offers a very basic framework for the process to guide scholars and practitioners in new products and services development (Murthy *et al.*, 2016; Yu and Sangiorgi, 2018). In particular, how the technology-enabled value co-creation process is performed within the digital engagement platform is underexplored (Lusch and Nambisan, 2015; Ramaswamy and Ozcan, 2018a; Hein *et al.*, 2019), leading to the underperformance and ineffectiveness of resource management in business networks. Put differently, if the value co-creation process is unclear, the actors with the most valuable resources might be reluctant to engage in the process, reducing the likelihood of participation in the network (Nambisan and Sawhney, 2011; Reypens, Lievens and Blazevic, 2016).

The discussion about the importance of digitalised value co-creation processes in a network setting nowadays is more relevant than ever (see the following meta-analysis and systematic literature reviews: Aarikka-Stenroos and Ritala, 2017; Li *et al.*, 2020). Specifically, the COVID-19 crisis has accelerated the growth and development of digital engagement platforms and their widespread adoption by business networks to conduct business in various fields and sectors, which would otherwise have taken years to achieve (Baig *et al.*, 2020; Nielsen, 2020; Shankar, 2020). Further, the importance of discussing the digitalised value co-creation process in business networks stems from the fact that digital engagement platforms provide network actors with (i) the capacity to perform an interactive dialogue that enhances both knowledge sharing and information flow, together with understanding of common goals and mutual benefits (Barrett *et al.*, 2015; Lombardo and Cabiddu, 2017); (ii) timely access to operant resources and new ideas (Breidbach and Maglio, 2016); (iii) informative risk/benefit assessment, which in turn provides the actors with the ability to evaluate and select which others they can successfully collaborate with, to assess their capabilities and competences, and to identify and resolve conflicts as they arise in a collaborative effort (Thornton, Henneberg and Naudé, 2015); and (iv) transparency enhancement and openness support, therefore encouraging new ideas and risk-taking (Ramaswamy and Ozcan, 2016). The aim of this research, therefore, is to provide a holistic conceptual framework to examine the technology-enabled value co-creation process in a business network context. We aim to further support the research aim by empirically testing the impact of the DART model on firm innovativeness in two business networks, namely fast-moving consumer goods (FMCG) and hospitality. Selecting FMCG and hospitality business networks in the Middle East and North Africa (MENA) region for the research is appropriate, not only because of the dearth of literature on value co-creation in the developing and emerging economy context, but also for a variety of other reasons. First, choosing two different business networks allows us to examine sectoral differences in network configuration and innovativeness, to generalise our results, and to better understand the value co-creation process for goods and service innovations. Second, both business networks host numerous organisations that are connected with cross-sector relationships. The diversity and number of actors in each business network increase the opportunities to reach potential senior/high level and experienced managers for our research purposes. Third, Zhang *et al.* (2018) assert that value co-creation in hospitality and tourism is still at an infancy stage, with few relevant empirical studies having been conducted. This is an opportunity to contribute not only to the S-D logic perspective, but also to the hospitality and tourism management discipline.

This thesis is inspired by the emerging stream of research that investigates (i) the role of the technology-enabled value co-creation process in enhancing firm innovativeness in a business network setting and (ii) the dynamic capabilities that the actors in business networks need to possess in order to be effectively and efficiently involved and engaged in such processes. Innovativeness refers to the introduction of new goods, services, processes or ideas that play crucial roles in generating value for firms in the marketplace and stock market (Tajeddini, Trueman and Larsen, 2006; Acur *et al.*, 2010). In essence, the thesis is based on different intersections of theories, including the S-D logic perspective (Vargo and Lusch, 2004, 2017); the dynamic capability view (DCV) of the firm (Teece, Pisano and Shuen, 1997; Teece, 2007); and social network theory (Freeman, 1979; Levitt and March, 1988; Wasserman and Faust, 1994). It uses the value co-creation concept to investigate the extent to which (i) the DART model impacts firm innovativeness; (ii) networking capability, which Mitrega *et al.* (2012, p. 741) define as firm-level capability pertaining to a set of activities that allows actors to initiate, develop, manage, utilise and terminate business relationships to their benefit impacts the DART model; and (iii) the location of actors in the business network, i.e., network position, moderates the networking capability-access to resources relationship.

1.2 Value co-creation process in business networks

According to the S-D logic perspective (Vargo and Lusch, 2004, 2017), a single actor cannot achieve complete self-sufficiency, since the required intangible resources for the value propositions are not fully available internally. In effect, the recent emphasis on taking a network perspective of value co-creation expands the role of digital engagement platforms in the value co-creation process (Vargo, Wieland and Akaka, 2015; Blaschke *et al.*, 2019). In particular, Winkler and Wulf (2019), amongst other scholars (e.g., Cabiddu, Lui and Piccoli, 2013; Lusch and Nambisan, 2015; Ramaswamy and Ozcan, 2016, 2018a), acknowledge the critical role of digital engagement platforms in creating synergies across the business network. This has led to a significant increase in the digital content of innovation, thereby shifting the focus of organisations towards being information-centric (Lusch and Nambisan, 2015; Xie *et al.*, 2016; Ramaswamy and Ozcan, 2018a). In effect, this focus has moved from tangible (direct) to intangible (indirect) resources, and towards connectivity, interactivity and ongoing relationships, which are essential for value co-creation (Prahalad and Ramaswamy, 2004; Lusch and Watts, 2018; Makkonen, Saarikorpi and Rajala, 2019). In this light, S-D logic asserts the significant role of the technology-enabled value co-creation process in harnessing actors' capabilities, competences and resources, in order to increase innovativeness, and subsequently increase value for all actors in the business network (Vargo, Wieland and Akaka, 2015; Vargo, 2018). Therefore, scholars and practitioners must understand how the interactions between actors that lead to resource integration occur and are facilitated in a digital platform aimed at value co-creation. However, the discussion in the value co-creation literature remains largely theoretical and lacks adequate empirical evidence (Ng, Maull and Smith, 2010; Murthy *et al.*, 2016; Jing and Mingfei, 2019). To date, S-D logic perspective only provides a set of foundational premises (FPs) and axioms (see Vargo and Lusch, 2016) and hardly offers a framework for the process to guide scholars and practitioners in new value proposition development (Yu and Sangiorgi, 2018).

1.3 Networking capability as an antecedent of the value co-creation process

The process of co-creating value occurs through the integration of resources (Vargo and Lusch, 2017; Ng and Vargo, 2018). The resources needed by the process are accessed through interactions with the various actors that own or control those resources; as such, interactions are the locus of the value co-creation process (Ramaswamy and Ozcan, 2018b). However, Tsai (2001) argues that resources are usually distributed unevenly within a business network. Digital engagement platforms gather geographically dispersed actors in one virtual space, yet resources will remain scattered within the network if they are not accessed, shared, and integrated among all parties (Lusch, Vargo and Tanniru, 2010; McIntyre and Srinivasan, 2017; Verbeke, 2020). As Tsai (2001) and Mitrega *et al.* (2017) argue, resources are difficult to spread across different actors within a business network in which pre-existing inter-organisational relationships are absent. Therefore, a way to benefit from network resources and co-create value is to manage the inter-organisational relationships that serve as channels for accessing external resources (Mitrega *et al.*, 2017; Xu, Yan and Xiong, 2019; Eggers *et al.*, 2020). By doing so, actors will realise the true potential of their network resources; in effect, value is co-created by and for all the actors, resulting in mutual benefits (Gummesson and Mele, 2010; Vargo and Lusch, 2011).

In addition, the strength of weak ties (SWT) theory, a derivation of social network theory (Granovetter, 1973; Borgatti and Halgin, 2011), argues that innovative ideas are often at the nexus of non-redundant indirect relationships among actors. Hence, actors increasingly utilise external resources in developing and/or creating new value propositions (Chesbrough, 2003). Indeed, not all inter-organisational relationships are beneficial unless the actors reach alignment of their common goals (Parida *et al.*, 2017; Fang *et al.*, 2019). Dynamic capability theory (Teece, Pisano and Shuen, 1997) suggests that actors require the ability to attract others with critical resources and to engage in collaborative relationships with them (Mitrega *et al.*, 2017; Mu *et al.*, 2017). Therefore, the actors should have the ability to manage their portfolio of relationships in the business network in order for the process to take place successfully and efficiently (Kohtamäki *et al.*, 2013; Jing and Mingfei, 2019; McGrath, Medlin and O'Toole, 2019). Hence, a lack of understanding of the antecedents of this process will hinder organisational ability in harnessing the full potential of the value co-creation process (Zhang *et al.*, 2015). In essence, Murthy *et al.* (2016) acknowledge the importance of identifying the antecedents and drivers of actors' participation in the process. Specific to business-to-business (B2B) inter-organisational relationships and network-focused research, our review of the literature revealed a number of antecedents of the value co-creation process, including resource transfer and organisational learning (Gummesson and Mele, 2010); business model compatibility (Valjakka *et al.*, 2013); and relational capability (Ngugi, Johnsen and Erdélyi, 2010; Nardelli and Broumels, 2018), which is alternatively termed networking capability (Zhang *et al.*, 2015; Murthy *et al.*, 2016).

In the thesis, we focus only on networking capability as the main antecedent of the value co-creation process in a business network setting for the following reasons. First, networking capability enables the exploitation of embedded strategic resources in the network for improved value co-creation (Zhang *et al.*, 2015; Nardelli and Broumels, 2018). Second, actors with strong networking capability tend to introduce a wealth of new knowledge and resources into their new value proposition development activities (Zaefarian, Forkmann, *et al.*, 2017; McGrath, Medlin and O'Toole, 2019). Third, digital engagement platforms enable the actors to select which others to collaborate with, depending on their evaluation of their competences and resources (Cova and White, 2010; Nordin *et al.*, 2018). The evaluation of other actors` competences and resources necessitates networking capability (Mu, 2013; Mitrega *et al.*, 2017; Jing and Mingfei, 2019). Finally, Ng and Vargo (2018) stress that resource integration during the value co-creation process is enabled and constrained by actors` ability to manage their inter-organisational relationships within their business network. Therefore, this research proposes that networking capability is a critical antecedent of the process (Zhang *et al.*, 2015; Nardelli and Broumels, 2018), and as such we argue that it is the specific competency that actors should possess to leverage collaborations and resource integration through value co-creation.

1.4 Network position as a moderator of the networking capability-access relationship

McGrath and O'Toole (2013) argue that networking capability enables actors to occupy a position that is more embedded in the business network. In effect, the number of relationships involving individual actors, i.e. degree centrality, shows that they occupy a central position (Tsai, 2001; Scott, 2017). The central network position fosters information flow (Borgatti and Halgin, 2011; Arranz, Arroyabe and Fernandez, 2020) and accelerates the transition of resources (Watts and Strogatz, 1998; Muller and Peres, 2019). Put differently, a network of inter-organisational relationships forms a channel for transmitting information and distributing resources (Borgatti and Halgin, 2011) in such a way as to support the value co-creation process and stimulate firm innovativeness. In effect, several scholars such as Swaminathan and Moorman (2009), Abrahamsen, Henneberg and Naudé (2012) and Muller and Peres (2019) emphasise that network position affects actors' potential to access resources, build relationships and influence other actors. Consequently, neglecting the influence of actor`s embeddedness in the business network limits the extent of the understanding of the factors affecting resource integration and the value co-creation process among actors (Laud *et al.*, 2015; Mele, Sebastiani and Corsaro, 2019). As a result, we argue that the impact of networking capability on actors` ability to access embedded resources in the business network is contingent upon the extent to which they are occupying a central network position, within which they can obtain specific information, knowledge, and competences needed for the value co-creation process. In particular, we argue that network position moderates networking capability-access relationships; the positive relationship between networking capability and access to resources will be stronger for actors with a more central network position, compared to a more peripheral one. In this research, network position is represented by two measures, namely in-degree centrality and closeness centrality. In-degree centrality is the number of relationships directed towards the actor, while closeness centrality refers to an actor's proximity to other actors; higher closeness gives the actor a higher power of reference (Klepac, Kopal and Mri, 2014).

In the above section, we presented three aspects of value co-creation in a business network context, including the challenges and opportunities that lead to the purpose and research questions of the thesis.

1.5 Purpose and research questions

The purpose of the thesis is to develop and empirically test a holistic conceptual framework to examine the performance effects of technology-enabled value co-creation in a business network context. Additionally, the moderation effect of the actor's network position on the networking capability-access relationship is examined. The thesis considers three aspects of value co-creation, namely the DART model, networking capability and network position. The specific research question (RQ) that guides the research is: In a business network context, to what extent does networking capability affect the digitalised value co-creation process that results in innovativeness and how does the actors` network position influence this process? To answer this RQ, we aim to address the following sub-questions:

RQ1. In relation to networking capability: How can networking capability be a catalyst for innovativeness through a technology-enabled value co-creation process in a multi-stakeholder business network?

RQ2. In relation to the value co-creation process in business networks and its impact on firm innovativeness: To what extent does the DART model affect firm innovativeness?

RQ3. In relation to network position: How does actors' network position (in-degree and closeness centrality) moderate the relationship between networking capability and their ability to access embedded resources in the business network?

The research methodology and design employed to answer the research questions and test the research hypotheses are described in the following section.

1.6 Research methodology, design and methods

In the review of the value co-creation, S-D logic perspective and business network literature, a number of empirical studies have been identified, from which the key empirical papers (see section 4.1) that inspired the methodology will be presented. To explain the complex multi-dimensional structure of the research context, our approach adopted a quantitative methodology combining two methods. The first method was social network analysis (SNA) using Gephi 0.9.2 and UCINET 6.0 software packages. The reasons for choosing SNA were due to the fact that SNA (i) allows the construction of a business network map and the extraction of centrality parameters in order to understand the business network position; (ii) helps to map the relationship directions, strength, knowledge flow, flow of resources, and information flow (Wickramasinghe and Bali, 2009); and (iii) indicates actors' involvement in resource integration and value co-creation (Donato *et al.*, 2017) through analysis of network positions. The second method was covariance-based structural equation modeling (CB-SEM) using the AMOS v0.25 software package, employed to test the identified relationships specified in the hypotheses. Using CB-SEM allows us to explain the parameters generated from the SNA and to test the direct and indirect effects sequentially among the variables in our hypothesised model. At the same time, CB-SEM enables us to concurrently address any anticipated common method bias (CMB) and/or endogeneity bias (Lowry and Gaskin, 2014; Sande and Ghosh, 2018). This combination of SNA and CB-SEM by itself is one of the unique contributions offered by this research, as described in section 1.6.2. In the meanwhile, the research procedure consisted of the following four phases.

Phase 1: Since the business network context is relatively new in the investigation of the value co-creation concept (Cabiddu, Lui and Piccoli, 2013; Aarikka-Stenroos and Ritala, 2017), together with the combination of SNA and CB-SEM (Xue *et al.*, 2018), the conceptual framework went through several modifications before reaching the final version. To ensure its robustness and the consistency of the units of analysis, two pilot studies were conducted on two business networks, namely FMCG and hospitality. However, when applying CB-SEM, the issue of unmatched units of analysis between the constructs from SNA and the remaining ones was encountered. The former were individual-level constructs, while the latter were firm-level ones. This issue occurred due to the fact that each organisation had multiple respondents when administrating the survey. Hence, it was decided to discard the use of the pilot study data and collect new data at later stages. Full details are given in the research methodology chapter (Chapter 4) section 4.8. The issues faced in the pilot studies were mitigated in the following phases.

Phase 2: Before administering the final survey to the research sample, the survey was piloted online and in person in early October 2019 after translating the items from English into Arabic and Turkish in order to (i) test the respondents' understanding of the questions; (ii) explain the aim of the research; (iii) extract the network position measures, specifically the two centrality measures related to our research - in-degree and closeness centrality; and (iv) ensure that the business network's digital engagement platform met the selection criteria. The data collection took place between October and December 2019 through an online-based survey using the Qualtrics platform. The respondents were asked to identify a maximum of 10 people from outside their own organisation by mentioning their company's name, with whom they frequently worked in their business network. Since our unit of analysis was the organisation in a business network context, each organisation was considered to be an actor (respondent), represented by one individual. The procedures of the data collection are discussed in detail in the research methodology chapter (Chapter 4).

Phase 3: SNA was applied using the Gephi 0.9.2 and UCINET 6.0 software packages in order to analyse the SNA parameters obtained from phase 2. The analysis was performed using centrality measures. This phase examined how the actors interacted; which actors played a significant role in value co-creation; and the extent of their contribution to the value co-creation process.

Phase 4: The survey data concerning networking capability, technology-enabled value co-creation, and firm innovativeness were examined by CB-SEM using the maximum likelihood (ML) algorithm in the AMOS 25 software package. Furthermore, the centrality measures extracted from SNA were treated as moderators in the first part of the measurement model between networking capability and access (access is the second component of the DART model) through CB-SEM (see Xue *et al.*, 2018). By achieving the research aim and objectives, this work will contribute to the marketing literature in the following ways.

1.7 The main contributions of the research

The significance of this research can be specified according to the novel theoretical, empirical, methodological and practical contributions discussed in the following sub-sections. Its uniqueness lies in its ability to (i) refine the understanding of the performance effects of technology-enabled value co-creation in a business network context, together with the network structure effects on the process, and (ii) to address several unanswered questions concerning value co-creation in the emerging fields of the S-D logic perspective, social networks, and innovation studies.

1.7.1 Theoretical, empirical and methodological contributions

The research aims to enrich the marketing literature, especially to the value co-creation strand, with the following theoretical, empirical and methodological contributions. Its main contribution is that it develops and empirically tests a conceptual framework to explain how the various actors in a multi-stakeholder business network integrate the various operant resources embedded within their network through a technology-enabled value co-creation process, which is necessary to enhance firm innovativeness. This conceptual framework is inspired by the DART model and links it to networking capability as a catalyst for innovativeness. By doing so, this research provides a theory-based explanation of how the DART model can be used to capture technology-enabled value co-creation which contributes to understanding the more complex inter-organisational settings. In particular, the proposed conceptual framework goes beyond the current dominance of dyadic business-to-customer (B2C) and B2B relationships (e.g., Payne, Storbacka and Frow, 2008; Edvardsson, Tronvoll and Gruber, 2011; Hein *et al.*, 2019) found in recent studies. Additionally, the conceptual framework offered by this research incorporates an important moderating effect of network position between networking capability and actors` ability to access embedded resources in the business network.

Acknowledging the essence of understanding the moderating effects of network position on the networking capability – access relationship, this phenomenon is explored through recent developments in the theoretical approach of S-D logic. In particular, this perspective advocates taking a holistic view of the value co-creation process that is network based (Vargo and Lusch, 2017). This research draws upon social network theory to enrich and complement the theoretical perspective of S-D logic. In doing so, it explains the importance of considering the endogenous role of network structure in resource integration, and empirically tests its moderating role in the networking capability-access relationship when examining the value co-creation process in the network. In other words, the contribution of the research to the S-D logic perspective is its recognition that it is not enough to simply construct a value co-creation framework based on a set of actors that integrate resources through interactions to gain mutual benefits (Ng and Vargo, 2018; Ramaswamy and Ozcan, 2018a). Instead, the actors in the business network are subject to the influence of the network structure, in particular their network position. We argue that social network theory can facilitate an understanding of the influence of the network structure on the actors. This provides the S-D logic perspective with clearer conceptual reasoning concerning improved understanding of the access to network resources required for the value co-creation process based on network position.

Empirically, the research provides further insight into the value co-creation concept and makes a conceptual contribution through empirical analysis of the DART model. By taking a holistic view i.e., the business network perspective, the hidden structural details of value co-creation are uncovered and a realistic perspective of the value creation process is created, which is in line with the claims of Vargo and Lusch (2017). The research also provides a unique insight into social network theory in the value co-creation context by providing in-depth primary data from the two business networks (i.e., the FMCG and hospitality sectors). The research focuses on the impacts of certain under-researched constructs (i.e., centrality measures) in S-D logic perspective-based research, which are particularly relevant to the business network context of value co-creation. These empirical and contextual contributions lead to the methodological contributions.

In terms of methodological contributions, a novel research method is introduced for value co-creation studies by combining CB-SEM with SNA. The approach involving investigation of network structure constructs as moderators when employing quantitative techniques, such as multiple regression and SEM, is not new for marketing and strategic management scholars in network-focused research (e.g., Ahuja, 2000b; Sparrowe *et al.*, 2001; Tsai, 2001; Bell, 2005; Thornton, Henneberg and Naudé, 2015; Arranz, Arroyabe and Fernandez, 2020; Tajeddini, Martin and Ali, 2020). However, the combination of SEM and SNA in this study provides a novel contribution. Although other researchers, such the examples cited above, have claimed to have employed such a combination, in practice they have only

(i) employed SNA to extract network structure measures; e.g., in-degree centrality (see Tsai, 2001) and degree centrality (see Yen, 2009)
(ii) used formulas to calculate network measures; e.g., network density and closeness centrality (see Mani and Luo, 2015) and network density (see Thomaz and Swaminathan, 2015)
(iii) adapted measurement scales of network structure measures; e.g., closeness to end users (see Thornton, Henneberg and Naudé, 2015) and social network ties (see Tajeddini, Martin and Ali, 2020)

for treatment as constructs in the statistical model, without actually performing SNA. This research provides a novel contribution in that it actually (i) goes beyond the mere use of centrality measures as constructs in SEM, to the undertaking of SNA in order to provide further elaboration of the SEM results; and (ii) compares how the different structures of the business networks being studied influence actors' ability to access network resources. In other words, this combination of SEM and SNA facilitates statistical and visual analysis, which provides an in-depth understanding of the results. In this way, greater clarity and more comprehensive interpretations of the influence of centrality measures are produced.

1.7.2 Practical contributions

In terms of practical implications, the comprehensive conceptual framework provided by this research improves value-focused practices in business networks in terms of value co-creation, and finally leads to improved firm innovativeness as a value-based outcome. In particular, the research will help marketers and practitioners to enhance their digital engagement platforms based on the DART model in order to enhance innovativeness, and consequently the organisation’s competitiveness. The increased firm innovativeness will ultimately enhance the actors` market, NPD marketing, and technological alignments, as evidenced by Acur, Kandemir and Boer`s (2012) study. The business network includes different entities, with different capabilities, backgrounds, skills, and experiences. These resources, along with their abundance, will remain latent unless they are discovered and properly exploited in the interest of all parties. According to Acur, Kandemir and Boer (2012), these strategic alignments as a result of innovativeness provide the actors with the ability to create superior customer value by (i) identifying current needs and anticipating the future ones of target markets; (ii) integrating market information into their value propositions; (iii) fostering strategic alignment and reaching common goals and shared understanding, especially within the marketing and NPD functions through communications; and (iv) actively detecting technological development in the market and exploiting it by integrating it into their value propositions.

Building on the discussion above, in due course practitioners will increasingly recognise that engagement with digital platforms will provide new resources, which will only come to life through the value co-creation process (Ramaswamy and Ozcan, 2018a; Vargo, 2018; Mele, Polese and Gummesson, 2019). Therefore, if the goal of the actor is to be creative and innovative, and at the same time to save time, effort and money in searching for innovative ideas and unique resources, they should first look at the business network to which they belong and are linked to through the digital platform. In essence, this digital platform should enable interactive and constructive dialogue between all parties, and it should also provide them with access to these resources to the point that brings economic value. Dialogue and access to resources may undoubtedly be fraught with risks such as unethical exploitation of resources, opportunism, and the loss of intellectual property. Accordingly, the digital platform should also provide the ability to analyse risks and enhance transparency between all parties.

Furthermore, by understanding value co-creation as a holistic process, managers can intervene in a timely fashion to bridge any significant gaps occurring in the business networks. They can accurately identify and prevent any causes of failures at the beginning of the process, rather than wasting time figuring out the problems. In addition, managers can also identify slack resources embedded in the business network and utilise them for new product and service development. The ability to recognise the potential risks, major constraints, failures and opportunities in the value co-creation process can assist practitioners to increase the chance of innovation success instead of trying and working out ambiguous solutions. Therefore, investing in the development of new digital platforms or improving existing platforms with the DART model in mind would be beneficial in improving firm innovativeness.

Digital engagement platforms nowadays are of interest to all kinds of organisations, including universities and businesses, healthcare and Science, Technology, Engineering and Maths (STEM) areas (Beech and Anseel, 2020; Nielsen, 2020), and multinational companies (MNCs) such as Apple, Starbucks and Nike, in their daily business practices and value co-creation activities (Ramaswamy and Ozcan, 2016, 2018a). For instance, Apple has already designed the digital App Store platform as a so-called 'digitalised interactive platform (DIP)' (Ramaswamy and Ozcan, 2018a) between, on one hand, customers and service providers, and on the other between software and application developers, enabling them to share resources and capabilities in order to develop joint applications. Awareness of the technology-based value co-creation process is even more obvious in the real-life examples of Hitachi and Toyota. These two companies have invested in projects that utilise the implications of collaboration and technologies to improve productivity and value proposition quality (Toyota, 2017), in what they refer to as "co-creating the future" (Hitachi, no date).

Before the COVID-19 crisis, the adoption of digital engagement platforms by organisations was in progress, but to a lesser extent than now (Dataquest, 2020; Marion and Fixson, 2021). Digital initiatives before COVID-19 were solely viewed as a business development process, not as a business priority. However, the quest for innovation and value co-creation is more pressing in the difficult pandemic situation, in which every actor, including customers, organisations and other stakeholders, are required to mostly interact virtually (Beech and Anseel, 2020; King, 2020; Shankar, 2020). Particularly now, digital engagement platforms are no longer mere development tools or distribution channels, rather they have become inseparable parts of businesses and individuals, as well as a vital key for organisational long-term competitive advantage (Baig *et al.*, 2020; Marr, 2020; Sneader and Sternfels, 2020). Common examples of such digital platforms that contribute nowadays to digital interconnectivity are Slack, Zoom and Microsoft Teams.

The COVID-19 crisis underscores the importance of digital connectivity and *"has reminded us about the extreme degree to which the world is interconnected"* (Budhwar and Cumming, 2020, p. 441). Several domestic and MNCs worldwide have substituted face-to-face (F2F) interactions with such collaborative and engagement-based digital platforms (Bick *et al.*, 2020). The use of digital technologies can be seen in several scenarios, such as online shopping and making working remotely from home possible in order to protect customers, employees and society at large (Baig *et al.*, 2020; Nielsen, 2020). However, few tools are available for integrative comprehension of the value co-creation process. In fact, specific to MNCs, Zeng, Khan and De Silva (2019) emphasise the necessity of understanding *"how interconnectivity and interactions manifest themselves in headquarters-subsidiaries dynamics, and in subsidiaries-local network ones"* (p. 12) using such digital technologies. Responding to this urgent need, this research provides insights into the importance of networking capability as an antecedent of the value co-creation process, thus supporting organisations in managing their relationship portfolio effectively. By developing a networking capability, practitioners are more capable of managing the relationship portfolio and resources amongst multiple actors (Vargo, 2018; Mele, Polese and Gummesson, 2019). Specifically, they can (i) initiate relationships with multiple actors within their business networks to have an admixture of redundant and non-redundant relationships to gain innovative ideas; (ii) develop and maintain their current relationships to foster their strength and increase trust among the actors, which in turn will enhance actors' willingness to share and integrate resources; and (iii) terminate certain relationships, consequently increasing the overall value of the relationship portfolio (Mitrega *et al.*, 2012) and outweighing the costs incurred by relationships that drain resources, as such leveraging their professional business network relationship.

The holistic conceptual framework offered by this research takes into account the interconnectivity of multi-stakeholder business networks and the performance effects of their network position. By considering their network position and the extent to which they are embedded in the business network, managers can identify opportunities at pivotal points in the overall business network to effectively capitalise on business potentials, resulting in a successful value co-creation process and the enhancement of innovativeness. Specifically, by implementing the model offered by this research, actors will be able to handle the diversity of accessible resources and manoeuvre themselves into more central positions by artfully rewiring their business network and restructuring their relationship portfolio. We argue that digital engagement platforms should have the functionality to show actors where they are situated in the wider business network. In this way, managers will proactively consider the consequences of each relationship they form and restructure their network to have a more central position. This will ultimately facilitate the identification of the gaps, i.e., structural holes, (Burt, 1992) in the business network where novel ideas and a plethora of intangible resources reside. This will eventually encourage both actors in peripheral positions and those in more central ones to establish direct (strong) and indirect (weak) ties in order to benefit from the knowledge and information flows for the value co-creation process.

Overall, this research provides valuable insights for marketers, managers and scholars into the growing importance of technology-enabled value co-creation in business networks for enhancing innovativeness by encouraging collaborative interactions and resource integration. The framework offered by the research can serve as a tool for practitioners to engage effectively in the value co-creation processes with their stakeholders and gain timely access to novel ideas and resources embedded in their business networks. As a result, practitioners will be able to enhance firm innovativeness, which in turn will foster their competitive advantage. The organisation and structure of the thesis are outlined in the following section.

1.8 Organisation of the thesis

In the introductory chapter, the background and motivation for conducting the research are presented. This includes the theoretical underpinning, research gaps, and research questions. Finally, an overview of the research methodology, and the main contributions of the research are given.

The second chapter is the literature review. This chapter begins by providing the background of the development of the value co-creation concept and critically explains its three components: value, the actors, and digital engagement platforms. It continues by discussing the changes and developments in the S-D logic perspective and its FPs, at the same time distinguishing between the goods-dominant (G-D) logic and the S-D logic perspectives. A critical discussion of the three aspects of value co-creation is made, namely the DART model, networking capability and network position. Next, the chapter discusses firm innovativeness, together with its antecedents and consequences, underscoring the reasons why it has been chosen as a value-based outcome for the digitalised value co-creation process in this research. Finally, the chapter discusses the research gaps, and presents a synthesis of the literature review findings and the intended research contributions.

The third chapter presents the theoretical framework derived from the literature review. This chapter is divided into three main sections. The first section discusses networking capability as an antecedent of the value co-creation process. Networking capability is expected to have a positive influence on innovativeness through four paths: (i) enhanced dialogue/communication between the business network actors; (ii) improved access to intangible resources; (iii) enhanced risk/benefit assessment; and (iv) increased transparency/symmetry among the business actors. The second section discusses the impact of the value co-creation process captured by the DART model on firm innovativeness. The DART model is expected to have a positive influence on firm innovativeness. The third section discusses the moderating effect of network position on the relationship between networking capability and access. The in-degree centrality measure of network position is expected to strengthen the relationship between networking capability and actors' access to intangible resources. Finally, the closeness centrality measure of network position is expected to strengthen the positive effect of networking capability on actors' ability to access intangible resources.

The research methodology is presented in Chapter 4. This chapter outlines the three major research paradigms in social science studies, namely interpretivism, positivism and the critical paradigm, related to our research. The chapter further discusses the ontology, epistemology, methodology and axiology of the interpretivist, positivist and critical paradigms. SEM and SNA are then discussed, followed by how the research deals with endogeneity bias and CMB issues. Next, the measures used to assess the constructs are presented. Finally, the outline of the pilot studies, the empirical setting, sample, procedures and data collection are discussed.

The fifth chapter presents the data analysis procedures and results. The chapter starts with a discussion of the descriptive statistics of the research sample and non-response bias test, followed by the SNA procedures performed to extract centrality measures, namely in-degree and closeness centrality. Next, further SNA is conducted to add more clarity and understanding to the CB-SEM analysis results in later stages. The chapter proceeds by measuring the reliability and validity of the research data. This section explains the exploratory factor analysis (EFA) using the IBM SPSS 25 software package, and then the confirmatory factor analysis (CFA) in the measurement model using the IBM AMOS 25 software package. CMB is tested for, and the goodness-of-fit indices for each step during the analysis of the structural model are presented. Finally, the chapter tests the research hypotheses, including the direct and indirect effects.

The sixth chapter presents a discussion on the findings, and the implications of the research for both academics and practitioners are stated. The seventh chapter comprises the conclusion. This chapter begins with an overview of the research aim, objectives and motivations for conducting the research, and summarises the research contributions. Finally, the limitations of the research are presented, with recommendations for future research.

Chapter 2. Literature Review

The key objective of this thesis is to advance and contribute to the marketing literature, specifically from the S-D logic perspective (Vargo and Lusch, 2004, 2017), through theoretical and empirical research. In more detail, it aims to develop and empirically test a holistic conceptual framework to examine the performance effects of the technology-enabled value co-creation process in a business network context. In addition, the moderation effect of actors' network position (in-degree and closeness centrality) on the networking capability-access relationship is examined. The introductory chapter presented the research gaps and the intended theoretical and practical contributions in detail. This chapter draws on the literature on value co-creation, the DCV of the firm (Teece, Pisano and Shuen, 1997; Teece, 2007) and social network theory (Freeman, 1979; Levitt and March, 1988; Wasserman and Faust, 1994), with the aim to (i) critically examine and synthesise the current state of the art thinking on value co-creation in order to present a conceptual technology-enabled value co-creation framework for the research; (ii) introduce readers to the developments that have taken place in the value co-creation concept thanks to advances in ICT and the expansion of the scope of the value co-creation concept, to include the variety of actors in business networks; and (iii) explain the notions of network position and actor embeddedness discussed in the literature on network-based research which is relevant to value co-creation.

This chapter is structured as follows. It begins with a clarification of the different conceptualisations of 'value' in social sciences as one of the components of the value co-creation concept, followed by an explanation of value creation and the emergence of the value co-creation concept. The chapter proceeds by critically discussing the other two components of the value co-creation concept, namely the actors and digital engagement platforms. It continues by providing a discussion on the changes and developments in the S-D logic perspective and its FPs, as well as distinguishing between G-D and S-D logic. Through reviewing the literature on value co-creation, we argue that it has three main aspects, specifically (i) the value co-creation process, with discussion of the different related frameworks derived from the literature review, with focus on each component of the DART model; (ii) the antecedents of the value co-creation process, with emphasis on networking capability, as in this research this is considered to be a critical antecedent of the value co-creation process; and (iii) network position, together with an overview of social network theory and its two derivation SWT and structural holes (Burt, 1992) theories. Finally, a discussion of firm innovativeness is provided, including the reasons why it was chosen for investigation as a value-based outcome of the digitalised value co-creation process, followed by additional discussion on the research gaps, together with a synthesis of the literature review findings and the intended research contributions.

2.1 Value

As previously mentioned in Chapter 1 (Introduction), value co-creation is a synergistic process whereby actors perform resource integration activities through interactions with each other, and where value is reciprocally created, consequently resulting in mutual benefits (Ramaswamy and Gouillart, 2010; Ranjan and Read, 2016; Vargo and Lusch, 2017). We also noted in Chapter 1 that ‘value’ has no specific definition. Upon reviewing the value co-creation literature, three conceptualisations of value, namely value-in-exchange, value-in-use and value-in-context, have been identified, which is in line with Gummesson and Mele`s (2010) and Vargo, Akaka and Vaughan`s (2017) research. Smith (1776/2000) defines value-in-exchange as *“the power of purchasing other goods which the possession of that object conveys”* (p. 31), while value-in-use is the utility obtained from using a particular object. Contrary to value-in-exchange and value-in-use, value-in-context is the manner in which actors interact, evaluate, perceive, use and experience the value propositions based on the spatial and social contexts they belong to (Vargo, 2008; Gummesson and Mele, 2010) in order to optimise the trade-off between the expected benefits and the integrated resources (Vargo, Maglio and Akaka, 2008; Vargo, Akaka and Vaughan, 2017). Understanding these different conceptualisations helps clarify what value is co-created and who co-creates it, thereby maximising the mutual benefits and the desired outcomes (Grönroos, 2008; Vargo, Akaka and Vaughan, 2017). In this section, the origin of the term ‘value’, specifically value-in-exchange from an economic point of view, and that of value-in-use and value-in-context from the marketing point of view is explained. Discussing these three types of value separately will allow us to simultaneously differentiate between G-D and S-D logic in later sections.

In his pioneering work *“The Wealth of Nations”* Smith (1776/2000) sheds light on the meaning of value from an economic point of view, and his ideas were embraced by numerous scholars and practitioners as a foundation for economic thought (Lusch and Vargo, 2006b). Smith expanded the traditional view of labour; i.e., quantities of labour, as the fundamental source of value into ‘nominal value’, namely the quantities of things, particularly the price the buyer is willing to pay to acquire a product in the marketplace (Vargo and Morgan, 2005; Vargo, Lusch and Morgan, 2006). In particular, Smith (2000) states that ‘value’ has two meanings; value-in-use and value-in-exchange.

Smith explains the relationship between value-in-use and value-in-exchange, which is known as the *“paradox of value”,* as it is an inverse relationship in which *“the things which have the greatest value in use have frequently little or no value in exchange; and on the contrary, those which have the greatest value in exchange have frequently little or no value-in-use”* (Smith, 1776/2000, p. 31). However, Grönroos (2011) argues that the value-in-use created during the value propositions' consumption or use is more important than value-in-exchange. Indeed, value-in-exchange is worthless for the beneficiaries if they cannot make use of the value proposition (Vargo, Maglio and Akaka, 2008; Vargo, Akaka and Vaughan, 2017). Similarly, Woodruff and Gardial (1996), Ballantyne and Varey (2006) and Grönroos and Ravald (2011) among others, argue that since the value for stakeholders can only be observed after the consumption or use of the value propositions in the form of value-in-use, focusing on value-in-exchange is less important for the organisation. This is because it cannot observe or measure value-in-use in the short-term, and the value-in-exchange might be low, although initial sales might give the impression of high value-in-exchange in the short-term. As a result, long-term revenues decrease when stakeholders' satisfaction with the value propositions decreases, as they are less likely to return. Hence, the value-in-use concept is not only important to the stakeholder but is equally important to the organisation. Given that, the creation of value-in-use is critical for organisations.

As can be seen, Smith's perspective of value implies that it is embedded in goods and inevitably connected with production. Hence, 'value' is captured in goods as an output of production. Value capture is defined as *"the appropriation and retention of payments by the firm made by consumers in expectation of future value from consumption"* (Priem, 2007, p. 220). In other words, value is captured when the customer pays for value propositions (monetary value) during the purchase process, which indicates a successful thwarting of competitors' efforts to acquire those payments; that is, value capture encompasses the allocation of value-in-exchange. Smith's perspective of value, precisely the nature of value as value-in-use and value-in-exchange, becomes the foundation of G-D logic (Vargo, Lusch and Morgan, 2006). In line with Smith (1776/2000), G-D logic posits that value is embedded in goods as attributes and features; that is, it is product-centric, with the organisation's roles being those of the 'producer' and 'distributor' of value, while the customer's role is to 'use up' or 'destroy' the value produced by the organisation (Vargo, Maglio and Akaka, 2008). Subsequently, the creation of 'value' occurs through a sequence of activities performed by the producer, which makes the roles of 'producers' and 'customers' distinct (Vargo, Maglio and Akaka, 2008).

Building on the value-in-exchange and value-in-use definitions of value, different definitions of value have emerged from the literature review, with some are focusing on (i) B2B relationships; (ii) the customer`s side of the relationship with organisations in B2C relationships; and (iii) the business network context. These definitions are presented below.

2.1.1 'Value' from the B2B relationship perspective

A group of authors, such as Porter (1985), Day and Fahey (1988), Hunt and Morgan (1995), Wilson (1995), Biong, Wathne and Parvatiyar (1997), Srivastava, Shervani and Fahey (1999), Walter, Ritter and Gemüden (2001), Rust *et al.* (2004) and Gruca and Rego (2005), define value from a relationship perspective in the B2B context, suggesting that all actors gain from the relationship by a synergetic combination of their strengths. In fact, these authors assert that value is perceived by the actors as the difference between the benefits gained from the relationship and the sacrifices made. In particular, Porter (1985) defines value as the amount buyers are willing to pay for an organisation's value propositions; the organisation makes a profit when this amount is greater than the cost of the value propositions and it is a measurement of total revenue. Value as defined here is value-in-exchange and represents its monetary side. Furthermore, future cash flows are supported by marketing scholars as an appropriate measure of value for stakeholders (Day and Fahey, 1988). Therefore, organisations maximise stakeholder value by increasing their satisfaction through higher cash flow (Rust *et al.*, 2004; Gruca and Rego, 2005).

As has been noted, value-in-exchange has been considered for decades as the locus of creating 'value' in the marketing literature (Grönroos, 2008), whereby 'exchange' is a G-D logic concept focused on short-term transactions. However, when the goal of marketing started to focus on creating value with the customer, i.e., being customer-centric (Sheth, Sisodia and Sharma, 2000; Sheth and Uslay, 2007), the role of involving the customer in creating 'value' was conceptualised as value-in-use. Moreover, B2B marketing stems partly from the work of the industrial marketing and purchasing (IMP) group (Håkansson and Snehota, 1995), which sees the creation of value to be embedded in business relationships; as such, the concept of relationships in B2B marketing is mainly transactional-oriented and based on value-in-exchange.

On the other hand, relationship marketing emphasises the importance for organisations of building and developing bonds with their customers in order to profit from customer lifetime value (CLV) through multiple transactions (Christopher, Payne and Ballantyne, 2004; Vargo and Lusch, 2010). Vargo and Lusch (2010) argue that relationship marketing is an extension of customer orientation, and is often manifested through information- and technology-driven approaches such as customer relationship management (CRM), through which organisations can develop, manage and maintain their relationships with customers.

2.1.2 'Value' from the customer side in B2C relationships

Collis (1994), Payne *et al.* (1995), Flint, Woodruff and Gardial (1997), Bowman and Ambrosini (2000), Huber, Herrmann and Henneberg (2007), Whittaker, Ledden and Kalafatis (2007) and Jaakkola and Hakanen (2013) define value from the customer perspective, representing the summation of all the positive effects obtained from value propositions. This group of authors argues that value is subjective and defined by customers based on the usefulness, or 'total utility', of value propositions. In other words, they assert that value is the difference between benefits and sacrifices, referred to as 'value judgment'. The benefits sought from what customers want to happen is also known as 'desired value'. These authors define desired value as the practical and emotional utility of the value propositions. Sacrifices, on the other hand, refer to the price customers are willing to pay. They represent a desired end-state, long-lasting core beliefs, or a higher aim resulting from the product performance. Accordingly, Vargo and Lusch (2004) posit that value is *"perceived and determined by the customer on the basis of value-in-use"* (p. 7). Similarly, Grönroos (2011) argues that 'value' from the customer perspective is defined as customers who *"are or feel better off than before"* (p. 282) after the consumption or use of the value propositions. According to Grönroos and Voima (2013)*, "[T]he notion of value-in-use as the extent to which a customer becomes better off could be analysed on multiple dimensions, according to what "better off" means"* (p.135). This implies that customers create value-in-use when they feel better than before when assisted by full-service or self-service processes.

In fact, contrary to the view of the value-in-exchange meaning of 'value' being rooted in the G-D logic, scholars such as Lusch and Vargo (2006a), Grönroos (2011) and Grönroos, Strandvik and Heinonen (2015), among others, argue that customers also create value when they add their resources, such as information, knowledge, skills and expertise, to the value propositions provided to them by the organisation. Consequently, the potential value created by resource integration is developed into value-in-use. However, interestingly, focus shifted specifically towards value-in-exchange as time passed due to S-D logic's inclination towards dyadic B2B relationships. Vargo and Lusch (2011) assert that *"all social and economic actors engaged in exchange (e.g., firms, customers, etc.) are service providing, value-creating enterprises; thus, in this sense, all exchange can be considered B2B"* (p.181). In response, Grönroos and Voima (2013, p. 135) argue that this view of value as seen by the S-D logic perspective *"leaves the underlying locus of value unclear. It cannot be value-in-exchange, because the customer's actions during usage are involved. It cannot be value-in-use, because the service provider's activities are involved. For the same reason, the nature of value is unclear"*. This confusion in these opposing opinions in defining value in B2B and B2C dyads leads us to define value from a wider perspective; i.e., the business network perspective, as discussed below.

2.1.3 ‘Value’ from the business network perspective

The view that value is only created and determined by the beneficiary is similar to the S-D logic perspective, which views the beneficiary as playing an active role in creating value (Lusch and Vargo, 2006a). The value co-creation perspective conceptualised by the S-D logic perspective also means that organisations perform resource integration processes through direct interactions with customers and other stakeholders in order to design value propositions that meet customers’ (beneficiaries’) needs and maximise their value-in-use (Vargo and Lusch, 2004).

The discussion of value from a B2B perspective captures the dyadic relationships between the actors (Håkansson *et al.*, 2009). In a business network context, numerous scholars, such as Gassenheimer, Houston and Davis (1998), Payne and Holt (1999), Vargo and Lusch (2004), Ulaga and Eggert (2006), Aarikka-Stenroos and Jaakkola (2012), Butler and Batt (2014) and Vargo, Akaka and Vaughan (2017) argue that the value of the relationship is a dimensional concept; it is more than the difference between the benefits and sacrifices definition of value and price-quality trade-off. In business networks, the price and value propositions are weaker differentiators, as business customers have many alternatives and options among suppliers, manufacturers and other business partners from which to choose in the market. For instance, in routinely purchased products, suppliers seek to differentiate themselves in different ways than cost considerations (Ulaga and Eggert, 2006). Thus, building strong business relationships shows more potential for differentiation through personal interactions, service support, and supplier know-how.

Furthermore, besides the monetary aspect of value, which consists of profit and return on investment (Amit and Zott, 2001; Smals and Smits, 2012), actors in the business network gain intangible value from the relationships, such as the reputation they gain from doing business with well-known organisations (Ford *et al.*, 2003; Lindgreen and Wynstra, 2005; Lindgreen *et al.*, 2012), access to new technologies and new resources, knowledge sharing, and product development services. Therefore, Vargo (2008) adds value-in-context to previous conceptualisations of value related to the value co-creation process. Value-in-context emphasises that indirect use of an organisation’s offerings can generate value for the beneficiary in spatial and social contexts.

To this end, based on value-in-use, value is an interactive preference experience (Holbrook, 2006), determined and perceived by the beneficiaries such as customers, suppliers, business partners and other stakeholders, in which the organisation only offers value propositions. Value propositions are interpreted from each actor’s perspective; that is, value-in-context. Therefore, the value-in-context concept is network-centric, and it combines the value-in-use (customer-centric) and value-in-exchange (supplier-centric) concepts (Gummesson and Mele, 2010; Lusch, Vargo and Tanniru, 2010). Hence, this research settles on Gummesson and Mele's (2010), Chandler and Vargo's (2011) and Vargo, Akaka and Vaughan's (2017) arguments that the term ‘value’ in the value co-creation concept denotes the value-in-context, to provide the conceptual clarity required to conduct an empirical study. Ramaswamy and Ozcan (2018b) argue that the debate on what ‘value’ is in value co-creation *“diverts attention away from the very act of “creation” among actors”* (p.197). Now, we know that ‘value’ is value-in-context, but what is value creation? It is important to clarify its meaning before the emergence of the value co-creation concept. The clarification of what value creation is will add more clarity to the meaning of value co-creation, which we will discuss in detail in later sections.

2.2 Value creation

Vargo and Lusch (2008a) and Grönroos (2011) define value creation broadly as creating value for customers (non-monetary) through using or consuming products and services while creating value for the organisation; e.g., monetary value such as revenue. Lusch and Vargo (2006a) and Gummesson (2008) argue that value creation is firm-driven, in that the organisation makes a value proposition to the customer, and the customer either accepts or rejects it. From this perspective, it is the organisation (producer or service provider) which creates value for customers and users. However, as acknowledged in Chapter 1 (Introduction), *“value creation is never explicitly defined”* (Grönroos and Voima, 2013, p. 135), in that, value creation has been defined in relation to different disciplines in the literature, such as marketing and strategic management. The issue of defining what value creation is related to the issue of defining what ‘value’ is, as noted several times in the earlier discussions. Since this research adopts the value-in-context meaning of value, it is worth discussing here how value creation was defined prior to the emergence of the value-in-context meaning of value and the value co-creation concept. This section discusses value creation from the customer-supplier dyad perspective in B2C relationships and the buyer-supplier dyad in B2B relationships, and how ‘value creation’ is transformed to ‘value co-creation’. Understanding the transition from value creation to value co-creation will allow us to bridge the gap underscored by Polese, Mele and Gummesson (2017), that there is a need to develop a new network-centric framework for value co-creation as a process resulting from the many-to-many relationships between all the actors involved, rather than confining the process to B2C and B2B dyads.

2.2.1 Value creation from the customer-supplier dyad in B2C relationships

In the customer-supplier dyad, Anderson and Narus (1995) acknowledge that value creation is the essential purpose for engaging in the relationship. Organisations manufacture products and offer services which are seen as, for example, value for customers, and customers pay to consume or use what is offered to them; i.e., value for suppliers, based on the trade-off between benefits and sacrifices. However, Anderson and Narus (1995, 2004) and Weerawardena and O'Cass (2004) argue that due to the intensity of the competitive pressure, organisations strive to generate profitability through (i) providing supplementary services to the core value propositions; and (ii) developing customer relationships. By developing relationships with customers, the organisation becomes market-driven, and creates greater value for its customers. Jaworski, Kohli and Sahay (2000) define the market-driven approach as the strategy taken by organisations to understand, learn and respond to customers` needs in a given market in order to adapt the value propositions according to their own needs. In other words, market-driven means *"hear the voice of the customer"* (Jaworski, Kohli and Sahay, 2000, p. 45), in that using the market-driven approach, the organisation adds value to its value propositions, and consequently gaining a competitive advantage.

Day (1994) argues that in order for a market-driven organisation to create superior value for its customers, it should possess a market-sensing capability when managing customer relationships. Day (1994) and Teece (2007) define market-sensing capability as the capacity of the organisation to gather, process, and interpret the meaning of market information acquired from (i) external sources, such as customers; and (ii) internal sources, such as in-house research and development (R&D) (Gumusluoglu and Acur, 2016) and marketing intelligence within the organisation. Through market-sensing capability, the organisation is able to (i) reduce market uncertainty and increase innovation opportunities (Day, 1994; Teece, 2007); (ii) enhance its NPD performance (Gumusluoglu and Acur, 2016); and (iii) enhance its absorptive capacity. Cohen and Levinthal (1990) define absorptive capacity as *"the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends"* (p. 128).

In effect, besides financial benefits, the organisation also benefits from its relationships with customers during the value creation process (Webster, 1992; Morgan and Hunt, 1994; Sharma and Sheth, 1997; FigueiredoI and Scaraboto, 2016), through acquiring knowledge and information, which in turn shift their focus from transaction marketing to relationship marketing. As a result, Sharma and Sheth (1997) shed light on the critical role of value creation for market-driven organisations in market-sensing, as well as linking customer capabilities with the organisations' capability in a way that increases competitiveness and innovativeness. In addition, Mizik and Jacobson (2003) and Priem (2007) expand this traditional view of value creation which implies that value is created through exchanging value propositions for money. In particular, Mizik and Jacobson (2003) and Priem (2007) emphasise that value creation in the customer-supplier dyad involves innovative activities that lead to an increase in customers' valuation of the benefits acquired from the value propositions; in other words, the customer`s willingness to endure the sacrifices.

2.2.2 Value creation from the buyer-supplier dyad in B2B relationships

In the buyer-supplier dyad, Lepak, Smith and Taylor (2007) argue that value creation is subjective, and depends on the relative amount of value realised by the trade-off between benefits and sacrifices. It is worth nothing here that the term 'buyer' in the buyer-supplier dyad refers to customer organisations, also known as industrial customers. Lepak, Smith and Taylor`s (2007) definition of value creation is in line with Brandenburger and Nalebuff`s (1996) work, in which *"the definition [of value creation] has two ingredients: the 'willingness-to-pay' of the buyer and the 'opportunity cost' of the supplier. The value created by the chain of players is defined as the first minus the second: Value created = willingness-to-pay – opportunity cost"* (pp. 7–8). However, Schiele (2010) and Smals and Smits (2012) argue that in the buyer-supplier dyad, value creation goes beyond mere monetary value creation. Specifically, in it suppliers can gain two types of value within the relationship: direct and indirect. Direct value represents the buyer's 'volume' (Walter, Ritter and Gemüden, 2001; Rao, Agarwal and Dahlhoff, 2004), meaning the volume of orders placed by the buyer and the 'profit' functions, which represent the profitability of that order.

On the other hand, indirect value denotes the value gained by the supplier from outside the present relationship (Hald, Cordón and Vollmann, 2009); for instance, the opportunity to attract new customers (potential buyers) through current customers. Nevertheless, customer organisations may gain from indirect value more than direct value (Christiansen, Rohde and Hald, 2003; Hald, Cordón and Vollmann, 2009), such as gaining access to crucial resources, knowledge, technologies and competences from suppliers. Similarly, Wilson (1995) describes value creation as a joint process in which competitive abilities are enhanced by both parties in the relationship. The value created by synergy between buyers and supplier fosters organisational capabilities and a shift from tangible to intangible resources. In effect, the value created in the relationship between the buyers and suppliers comes in a variety of forms (Wilson, 1995); e.g., access to new markets, technology, information and knowledge.

Accordingly, Wilson (1995), amongst others (e.g., Sharma, Krishnan and Grewal, 2001; Higgins, 2002; Payne and Frow, 2005), emphasises that organisations should apply value-driven strategies rather than traditional job roles in order to coordinate the functions in the value creation process. The organisation transforms the value-driven strategy outputs such as product delivery, technology delivery, and finally customer delivery, into programs by a value creation process in order to extract and deliver value. However, Grönroos and Helle (2010) argue that value creation is predominantly analysed and discussed as a separate phenomenon in terms of both value for the buyer and value for the supplier.

As noted in the previous section, contemporary marketing literature has changed its perspective about 'value' and is increasingly abandoning the traditional perspective of it, i.e., value-in-exchange, in marketing. In effect, this literature, through the lens of the S-D logic perspective, argues that value creation occurs when potential resources are turned by the actors into specific benefits. Since the S-D logic perspective defines value as value-in-context, it also considers value to be jointly co-created in the interactions between actors in the relationship through resource integration that results in mutual benefits (Gummesson, 2008; Vargo, Maglio and Akaka, 2008; Grönroos and Helle, 2010; Francesco, Cristina and Evert, 2017; Ramaswamy and Ozcan, 2018b; Hein *et al.*, 2019). In essence, value co-creation is an all-encompassing process, which means all actors, without distinction, are involved in co-creating value (Vargo and Lusch, 2017; Ramaswamy and Ozcan, 2018b). Therefore, stakeholders, specifically customers, always play a role in value co-creation through their interactions. In the following section we discuss the emergence of the value co-creation concept.

2.3 Value co-creation

Before discussing the value co-creation concept in detail, we must first discuss the circumstances and drivers that prompted its creation. Discussing these circumstances and drivers will give the concept and its importance in the marketing and strategic management literature greater clarity. The value co-creation concept emerged thanks to globalisation and the advances in ICTs. These both impact on customers and organisations in several ways. First, the traditionally defined roles of (i) customers being recipients of value propositions; (ii) business partners, such as suppliers, as mere providers of materials, products and services to the manufacturers and service providers (Prahalad and Ramaswamy, 2000); and (iii) coopetition between rivals instead of competition, which Bengtsson and Kock (2000) define as cooperative competition through sharing knowledge with rivals, have become more blurred and more interactive rather than strictly defined (Prahalad and Ramaswamy, 2000; Perks and Jeffery, 2006; Tuli, Kohli and Bharadwaj, 2007; Garcia Martinez, 2014). Put differently, the markets have become more heterogeneous and competition is more fierce, coupled with empowered customers and other stakeholders that are able to make informed purchase decisions. Moreover, customers and other stakeholders, such as business partners, have started to become involved in activities such as co-diagnosis, co-ideation, co-valuation, co-design, co-testing and co-launching (Lusch, Vargo and O'Brien, 2007; Hoyer *et al.*, 2010; Russo-Spena and Mele, 2012), that were previously confined to the manufacturers of products or service providers (Prahalad and Ramaswamy, 2000, 2004; Kingston, 2004).

Second, ICTs has created new avenues for collaborative processes and increased the digital content of innovation (Ordanini and Parasuraman, 2011; Lusch and Nambisan, 2015). This content pertains to the application of actors` competences such as knowledge, expertise and skills in the innovation process. ICTs create an interactive medium where the various stakeholders can share and integrate their operant resources, which act upon operand resources. The connectivity and interactivity offered by the ICTs has contributed to the development of business networks (Vargo and Lusch, 2016; Polese, Mele and Gummesson, 2017; Mele, Polese and Gummesson, 2019). As previously mentioned, Kohtamäki and Rajala (2016), Vargo and Lusch (2016) and Ng and Vargo (2018) define the business network, the so-called "service ecosystem" (Lusch, Vargo and Gustafsson, 2016), as a group of individuals and organisations, which are referred to as 'actors' in the current research, working together based on common strategic objectives.

There are numerous examples from practice of ICTs enabling the involvement of various stakeholders in the value proposition development. For instance, in the IT and electronics sectors, application developers can use the digital platforms offered by organisations such as IBM, Samsung, LG and Apple to develop and share applications within the platforms for businesses and final users. In B2C relationships, ICTs enable the organisations to co-test, co-evaluate and co-promote the value propositions with influential and opinion leaders, those *"network members who are effective in persuading or influencing others"* (Muller and Peres, 2019, p. 10). Ramaswamy and Ozcan (2016, 2018a) illustrated how Apple, Starbucks and Nike co-created value with customers and service providers (such as smart device application developers) through digital engagement platforms such as the AppStore and DIPs such as the Apple Watch (AW) and Nike plus application (NP), and the mix of the two, AWNP. The value co-creation outcomes of these organisations are mainly focused on branding and co-created customer experience.

Another real-life example of how organisations have started to realise the benefit of value co-creation in a broader context than the B2C and B2B dyads mentioned in the examples above, is Hitachi and Toyota. In late 2017, the two corporations announced their collaboration in building a platform using their latest technologies in order to improve productivity and value proposition quality (Toyota, 2017). Similarly, Hitachi embarked on several projects to create digital engagement platforms and to utilise the internet of things (IoT) in light of their new vision of social innovation, which they refer to as ‘co-creating the future’ (Hitachi, no date). Hitachi asserts the importance of involving various stakeholders such as customers, suppliers, competitors and non-governmental organisations (NGOs) in the value co-creation process as a critical strategy in social innovation and to deliver value not only for customers and business, but also for society at large.

Third, given the advances in ICTs, product-centric organisations are confronted by increased competition, new customer demands, and high commoditisation levels (Berghman, Matthyssens and Vandenbempt, 2012; Kindström, Kowalkowski and Sandberg, 2013). Commoditisation implies that value propositions are no longer distinguishable in terms of uniqueness or brand, and are seen by buyers, whether final customers or customer organisations, as simple commodities, whose price is the only factor the buyer takes into consideration during purchase (Kotler, 2000). Subsequently, organisations face continuous pressure to create superior customer value and differentiate their value propositions (Berghman, Matthyssens and Vandenbempt, 2012; Garcia Martinez, 2014). These observations have triggered scholars` interest in finding fundamentally new ways to differentiate their value propositions in order to escape the commoditisation trap (e.g., Berghman, Matthyssens and Vandenbempt, 2012).

The inclusion of customers as co-producers has been suggested as a non-conventional way to create differentiation and fight increased commoditisation (Kambil, Friesen and Sundaram, 1999; Ramirez, 1999). Marketing and management scholars have already investigated how organisations could involve customers in innovation, service delivery and NPD (e.g., Von Hippel, 1986; Normann and Ramírez, 1994; Wilson, 1995; Wikström, 1996a). However, Ramírez (1999) argues that the attempts made by them to include customers in value propositions innovation and development are based on inherited frameworks from the industrial era which are rooted in the G-D logic. For instance, the industrial view of value production is that the creation of value propositions is best described in ‘value chains’, where ‘chain’ implies that value is ‘added’. It is a sequential unidirectional process in which consumption of the value propositions is not considered as a factor of production (for a comprehensive discussion on these models, see Ramírez (1999)). However, due to ICTs, value creation ‘production’ is less of a sequential process, instead being a more synchronous and interactive rendering of value co-production; as such, more understanding and a conceptual framework were needed for customers` inclusion in value propositions innovation (Normann and Ramírez, 1994; Ramírez, 1999). Therefore, in the early 2000s, Prahalad and Ramaswamy introduced the value co-creation concept in their article *“Co-opting Customer Competence”*. The timeline of the emergence of the value co-creation concept is shown in Appendix 1.

The value co-creation concept was later popularised by Vargo and Lusch in 2004 when they introduced the S-D logic perspective as a new logic in marketing which was an alternative to traditional G-D logic, and to advance current service science through providing a framework for service innovation (Vargo and Lusch, 2004). Maglio and Spohrer (2008, p. 18) define service science as "…*the study of service systems, aiming to create a basis for systematic service innovation*".

As shown in Table 2.1, the value co-creation concept has received great attention from marketing and strategic management scholars, and has been addressed by different research streams such as innovation, open innovation, service innovation, social innovation, information systems (IS), retailing, e-commerce, tourism, branding and value innovation through artificial intelligence (AI).

Table 2.1: Value co-creation concept in different research streams.

Research stream	Author (s)
Conceptual papers, systematic literature review and management frameworks	Vargo and Lusch (2008), Ostrom *et al.* (2010), Frow *et al.* (2015), Gönroos, Strandvik and Heinonen (2015), Aarikka-Stenroos and Ritala (2017), Ramaswamy and Ozcan (2018b), Makkonen, Saarikorpi and Rajala (2019) and Li *et al.* (2020).
Innovation	Füller, Hutter and Faullant (2011), Ketonen-Oksi and Valkokari (2019).
Open innovation	Garcia Martinez (2014).
Service innovation	Frey, Trenz and Veit (2019).
Social innovation	De Silva *et al.* (2020).
Information systems (IS)	Lusch and Nambisan (2015), Nambisan *et al.* (2017), Winkler and Wulf (2019).
Retailing	Andreu, Sánchez and Mele (2010), Bassano *et al.* (2018).
E-commerce	Yu *et al.* (2020).
Tourism	Malone, McKechnie and Tynan (2018), Zhang *et al.* (2018).
Branding	Merz, He and Vargo (2009) Andreu, Sánchez and Mele (2010), Ramaswamy and Ozcan (2016).
Value innovation through (AI)	Russo-Spena, Mele and Marzullo (2019).

Source: Own elaboration

Upon reviewing the value co-creation literature, we encountered many attempts to define and clarify the value co-creation concept in the last decade, with value creation and growth becoming important aspects for managers. Several scholars, such as Edvardsson, Skålén and Tronvoll (2012) Neghina *et al.* (2015) and Ramaswamy and Ozcan (2018b), argue that the various conceptualisations of value co-creation coupled with the intellectual debate regarding what constitutes 'value' make it challenging for business practices and theory development. Appendix 2 shows 26 different conceptualisations of value co-creation across different disciplines, such as service marketing, service science, relationship marketing, industrial marketing and strategic management, as adapted from McColl-Kennedy *et al.* (2012). As can be seen in Appendix 2, the different conceptualisations of value co-creation are divided into two categories, namely customer-focused and organisation-focused. The following sub-sections address these two categories and further include and elaborate on other definitions and conceptualisations of value co-creation derived from the literature review.

2.3.1 The value co-creation concept from the B2C relationship perspective

In their fundamental paper, Prahalad and Ramaswamy (2004) define value co-creation as the joint action of creating value among various stakeholders for their mutual benefit. Specifically, from the B2C perspective, they posit that value co-creation is not about the organisation trying to please the customer, but about the joint creation of value. In this regard, several scholars, such as Vargo and Lusch (2004, 2008b, 2008a), Prahalad and Ramaswamy (2002, 2003, 2004) and Payne, Storbacka and Frow (2008) have conceptualised customers as active 'endogenous', rather than passive 'exogenous', recipients of value propositions. They argue that customers play an active role in some activities that traditionally were seen as organisational activities, such as providing ideas for value proposition development, co-design, co-evaluation and self-service. As such, customers are involved to varying extents in several activities to integrate their operant resources with those of organisations in order to co-create value.

Moreover, Prahalad and Ramaswamy (2004) argue that in the B2C context, value co-creation is about the organisation allowing customers to construct their value; referred to as value-in-experience, in a way that suits their individual context. It follows that organisations need to engage customers in the creation of core offerings through explicit and ongoing dialogue in order to harness their competence. As such, value co-creation in the B2C context is conceptualised as a two part, i.e., organisation-customer concept, in which the types of co-created value are value-in-use from the customer perspective, and value-in-exchange from that of the organisation (Grönroos, 2011) which is in line with the previous discussions in section 2.1.

We notice that the value co-creation concept, especially in the B2C context, can be confused with other concepts, such as customisation and personalisation. As customers infer value and experience from their interactions with an organisation, organisations move beyond personalisation and customisation of their offerings towards value co-creation, allowing customers to shape their personalised experience themselves (Prahalad and Ramaswamy, 2000; Schau, Muñiz and Arnould, 2009). While customisation means giving customers the ability to modify value propositions to suit their particular needs (Sunikka and Bragge, 2012), personalisation refers to the actions taken by organisations to tailor the value propositions based on previously collected or readily available customer data and predictive technology (Arora *et al.*, 2008). Hence, Prahalad and Ramaswamy (2000) stress that value co-creation should not be confused with customisation or personalisation.

Customisation assumes that organisations design their value propositions (offerings such as goods and services) to suit customer needs by allowing the customer to explicitly choose from a list of features, while personalisation *"is about the customer becoming a cocreator of the content of their experiences"* (Prahalad and Ramaswamy, 2000, p. 84). Unlike customisation, the organisation allows customers to discuss their desired features rather than choosing from a list. Both customisation and personalisation suggest that customers create their own experience, and interact with the organisation to tailor an offering for their own use (Sunikka and Bragge, 2012). However, in value co-creation, the co-created value propositions are made available to everyone else. Customers become partners, and may cause a radical change in the value propositions (Ramaswamy and Ozcan, 2016).

Furthermore, interactions, experience and engagement are recognised as crucial constituents of value co-creation (Bendapudi and Leone, 2003). Therefore, customers and other stakeholders play an active role in co-creating value across different stages of the value propositions: production, consumption and usage, through direct and indirect collaborations (Frow and Payne, 2011; Lusch, Vargo and Gustafsson, 2016). However, the value co-creation concept goes beyond customisation and personalisation, and encompasses both the production and value chains to highlight the collaborative co-creation of value among actors in business networks (Hunt and Madhavaram, 2006; Ranjan and Read, 2016). In effect, interactions (through dialogue), experience and engagement are recognised as crucial constituents of value co-creation (Bendapudi and Leone, 2003).

Accordingly, value co-creation from the B2C perspective is about deploying both the organisation's and customers' operant resources through meaningful interactions aimed at co-creating experience with customers (Prahalad and Ramaswamy, 2000; Xie, Bagozzi and Troye, 2008). It is worth noting that the notion of involving customers with organisational activities is not particularly new; what is new is that "*the enterprise cannot deliver value, but only offer value propositions"* (Vargo and Lusch, 2008b, p. 7). In other words, the organisation partially provides input into the value creation process, while the other inputs come from the customers' own operant resources. In this way, value is co-created and realised by customers during the value co-creation process.

2.3.2 The value co-creation concept from the B2B relationship perspective

Vargo and Lusch (2008b, 2011), amongst other scholars (e.g., Cova and Salle, 2008; Payne, Storbacka and Frow, 2008; Edvardsson, Tronvoll and Gruber, 2011), expanded the perception of value co-creation to the B2B context that represents the buyer-supplier dyad. In this context, value co-creation occurs through the integration of the various operant resources among the actors, as well as cross-functional teams, in order to gain mutual benefits. These benefits include, but are not confined to, reducing costs and increasing profitability to enhance the organisation's revenue (Ulaga and Eggert, 2006; Cova and Salle, 2008; Enz and Lambert, 2012). However, Vargo and Lusch (2011, 2016, 2017) argue that the dyadic interactions between the actors in B2C and B2B settings do not take place in isolation, but are just a part of their business network. Actors in business networks interact with each other through technology, language and through other actors in the network, in order to engage in collaborative activities and resource integration for value co-creation.

The interactions among the actors occur on an engagement platform, where they all share their own resources, and integrate the other actors' resources, consequently creating new resources that enhance innovativeness and competitive advantage (Ramaswamy and Ozcan, 2016, 2018a; Hein *et al.*, 2019; Mele, Polese and Gummesson, 2019). The reciprocity in the interactions implies that each actor performs two roles: (i) the role of value provider, i.e., sharing resources; and (ii) the role of the beneficiary of value, i.e., through resource integration and creating value from these external resources (Chandler and Vargo, 2011). Through the process of value co-creation, the actors develop and enhance their skills, expertise and knowledge, enriching their engagement in future value co-creation interactions (Vargo and Lusch, 2008b; Polese, Mele and Gummesson, 2017). This has prompted scholars and practitioners to investigate the value co-creation process from a business network perspective in order to develop a deeper understanding of the phenomenon (Siltaloppi and Vargo, 2017). The following sub-section discusses (i) who the actors are, and (ii) digital engagement platforms as critical components of the value co-creation concept.

2.3.3 The components of the value co-creation concept

We noted earlier in this chapter, numerous scholars such as Vargo and Lusch (2017), Vargo, Akaka and Vaughan (2017), Ng and Vargo (2018), and Ramaswamy and Ozcan (2018b), have emphasised the need to broaden the perspective of value co-creation beyond simply customers, to include various stakeholders such as suppliers, wholesalers, independent inventors and even competitors. The inclusion of various stakeholders in the value co-creation process allows the exposure of organisations to new knowledge, resources, and novel ideas. This in turn maximises the performance outcomes of the process for all parties, such as firm innovativeness, enhanced customer experience, and competitiveness (Vargo, Wieland and Akaka, 2015; Vargo, 2018; Hein *et al.*, 2019). Although the comprehensive view of value co-creation sounds promising, scholars such as Grönroos (2008, 2011) argue that the use of 'value co-creation' as an all-encompassing expression is not free of debate and causes ambiguity in understanding the type of resources, who they are for (i.e., 'co'), the type of 'value' and what the process is (i.e., 'creation') related to how value is co-created and where this process takes place (Mahr, Lievens and Blazevic, 2014). That is, there are three distinct components for value co-creation, namely value, actors, and digital engagement platforms, in accordance with recent literature on value co-creation (e.g., Barrett *et al.*, 2015; Frow *et al.*, 2015; Lusch and Nambisan, 2015; Ramaswamy and Ozcan, 2018a; Frey, Trenz and Veit, 2019; Hein *et al.*, 2019). In section 2.1, we discussed in detail the first component of the value co-creation concept, i.e., 'value'. The following sub-sections move the discussion onto the remaining two components of the value co-creation concept, namely the actors and digital engagement platforms.

2.3.3.1 Actors

The traditional conceptualisation of value creation in the notions of G-D logic is based on a linear supply chain model (Vargo, Lusch and Akaka, 2010), in which the supply chain is characterised in terms of the physical gaps (i.e., geographical distance) between the manufacturer and end-customers. These physical gaps were traditionally bridged by vertical integration with intermediaries such as wholesalers and retailers, who contributed their operant resources to the manufacturer's outputs. As such, Vargo, Lusch and Akaka (2010) argue that the real value of the value propositions is manifested in the operant resources that are embedded in the physical products.

In contrast to G-D logic, S-D logic perspective draws on Normann`s (2001) concept of 'resource liquefaction', which refers *to "the decoupling of information from its related physical form or device"* (Lusch and Nambisan, 2015, p. 160); in other words, the separation of operant resources from tangible products. Resource liquefaction changes the nature of the business network in terms of resource mobilisation and the connectivity of resources, which in turn makes most of the supply chain concepts inadequate (Vargo, Lusch and Akaka, 2010, p. 149). In other words, resource liquefaction changes the place where value is created, the activities associated with value creation, and the medium in which value is created and delivered; i.e., physical versus virtual interfaces. As such, resource liquefaction and the focus on operant resources exponentially increases the opportunities which arise from searching for other sources of operant resources that are necessary for the value propositions (Lusch and Nambisan, 2015). In fact, these operant resources reside in a business network context, in which the level of connecting resources is not limited to linear, vertical or horizontal agreements. Consequently, integrating these resources is a major source of innovativeness and competitive advantage.

As discussed in section 2.3, S-D logic perspective views value creation beyond the organisation-customer divide, with actors viewed as producers of value for other actors, such as customers and business partners, who are passive recipients, toward synergistic interaction between multi-actors which aims for value co-creation. Furthermore, the concept of value co-creation, according to Prahalad and Ramaswamy (2004), Lusch and Webster (2011) and Ramaswamy (2011), involves multiple actors, who enrich the value co-creation process by sharing their resources and competences. We have acknowledged in several places that although the definition of value co-creation offers an inclusionary perspective on the actors involved in the process, researchers tend to focus on that between the organisation and its customers, whether they are end-users, i.e., the B2C dyad or customer organisation/industrial customers, i.e. the B2B dyad (Cova and Salle, 2008; Hakanen, 2014).

The dyadic perspective of value co-creation, in which actors assess needs and propositions, represents a simple form of value co-creation, in which customers` needs are well defined and simple (Ranjan and Read, 2016). However, as noted in Chapter 1 (Introduction) and section 2.3, the advances in ICTs empower not only the customers to play an active role in co-creating value, but also other actors in the business network. In addition, actors are linked to a network of interdependencies, taking part in activities related to other actors in the business network. That is, every organisation is part of a network and a context, performs activities and possesses resources; actors are involved in inevitable continuous adaption to business relationships and cannot be isolated from other actors in the network (Achrol and Kotler, 2012; La Rocca and Snehota, 2014). Therefore, to enhance innovativeness and strengthen competitive advantage, value co-creation in a business network context transforms the actors from exogenous targets and resources, to active players who define the interaction and the value derived from it (Prahalad and Ramaswamy, 2003; Vargo and Lusch, 2017). However, few studies have considered the complex and dynamic systems of the inter- and multirelationships from a holistic perspective, in which the different actors are embedded and interact to co-create value.

Lusch and Nambisan (2015) argue that the actors in business networks integrate their resources with those of other actors for two reasons. First, *“all innovation is the result of recombining existing resources”* (Arthur, 2009, p. 160). In other words, innovations resulting from combining existing resources become resources to be combined with others, and so on, and as such innovations are limitless. Second, the S-D logic perspective argues that actors’ resources cannot be used in isolation, but need to be combined with other resources in order to extract their value (Lusch and Nambisan, 2015; Vargo and Lusch, 2017). In essence, business networks are goal-oriented value-creating systems in which a single actor cannot mobilise individually in a new business field or innovation; therefore, actors establish collaborative networks in order to achieve their goals (Möller, 2010; Handayati, Simatupang and Perdana, 2015; Kohtamäki and Partanen, 2016; Matinheikki *et al.*, 2017).

It can be seen from the above discussion that the S-D logic perspective is in line with the DCV of the firm, which emphasises the important role of dynamic capability in providing actors with the ability to manage their relationship portfolio in a way that changes their network in favour of its business aim (Smith and Laage-Hellman, 1992; Helfat *et al.*, 2007; Teece, 2007; Thornton, Henneberg and Naudé, 2015). The DCV of the firm is an extension of the resource-based view (RBV), whose main focus is on the internal environment of the organisation as a source of competitive advantage (Barney, 1991; Eisenhardt and Martin, 2000). The RBV proposes that organisations are heterogeneous, as they possess different resource mixes (Barney, 2012).

The resources, whether they are physical (e.g., specialised equipment), human (e.g., skills and expertise), or intangible (e.g., information), used by the organisations to implement value-creating strategies are at the heart of the RBV (Eisenhardt and Martin, 2000). As such, it has been used in value co-creation studies to examine the resources and capabilities, such as marketing, innovation and dynamic capabilities, needed for value co-creation (e.g., Zhang *et al.*, 2015; Kohtamäki and Rajala, 2016). In particular, the RBV focused the attention of scholars and practitioners on determining and exploiting internal strategic resources such as competences, assets and capabilities, for the organisation and its suppliers (Barney, 2012). These strategic resources are able to deliver a comparative advantage in order to achieve a sustainable competitive advantage (Barney, 2012; Helfat and Raubitschek, 2018). However, the RBV has been criticised for two main reasons.

First, Hunt (1995) argues that it is supplier-oriented, and lacks customer orientation. Lintukangas, Kähkönen and Hallikas (2019) define supplier-orientation as *"the organisational activity of managing supplier relationships to achieve the firm's goals and is considered a possible strategic orientation of a firm"* (p. 4). In other words, supplier orientation means that the organisation is focusing mainly on the upstream supply chain (Shin, Collier and Wilson, 2000); that is, choosing their suppliers in terms of finding a strategic fit when searching for external resources through coordination with suppliers. By doing so, the RBV is neglecting customer needs and wants when searching for strategic resources for their value propositions. Second, Teece, Pisano and Shuen (1997) argue that the RBV does not adequately explain how organisations obtain a competitive advantage in rapid and unpredictable environments. Therefore, Teece, Pisano and Shuen (1997) extended the RBV into the DCV of the firm by accounting for the dynamic nature of the business environment.

Teece, Pisano and Shuen (1997) and Madhavaram and Hunt (2008) define dynamic capabilities as the organisation's ability to adapt itself efficiently and/or effectively to rapidly changing environments, through its capacity to build, reconfigure and integrate internal and external resources, competences and capabilities to achieve superior performance. According to this definition, dynamic capabilities emphasise the changeable nature of competitiveness, and treat organisations' capabilities as intangible resources to deploy and reconfigure their resources in order to improve performance (Teece, 2007; Mitrega *et al.*, 2012). Prahalad and Hamel (1990) argue that dynamic capabilities are characterised by being difficult to mimic by competitors; in addition, their dynamic nature offers the organisation the capacity to match its resources with those of other actors in the business network in response to changes in the environment (Barney, 1991; Teece, Pisano and Shuen, 1997; Johanson and Vahlne, 2011). In this light, the network approach focuses on the relationships between actors in networks, rather than the attributes and characteristics of individual ones; therefore, in the last decade, the network approach has received much attention from scholars for its ability to provide an explanation of organisational phenomena (Snow and Fjeldstad, 2015; McIntyre and Srinivasan, 2017; Piazza *et al.*, 2019).

Social network theory is the study of interactions among various set of actors within a network, represented by graphs that indicate the symmetrical and asymmetrical relationships between them (Borgatti and Halgin, 2011; Scott, 2017). From the network perspective, relationships between actors (referred to as social entities) are the central focus; network theories take into account the web of relationships in business networks in which the actors are embedded (Möller and Halinen, 1999; Borgatti and Foster, 2003; Scott, 2017).

What makes social network theory distinct from other theories, such as the RBV, the DCV of the firm and the relational view (RV) of competitive advantage (Dyer and Singh, 1998), is that it *"is not simply a relational orientation, but the fundamental concept of the network"* (Daly, 2010, p. 29). Thereby, social network theory provides a holistic view of a given organisational phenomenon, since outcomes such as inter-organisational collaboration, firm performance, innovation and creativity are not only explained by actors' attributes and characteristics, but also by the attributes and characteristics of the network in which they are embedded (Wellman, 1988; Borgatti and Foster, 2003; Borgatti, Brass and Halgin, 2014).

In accordance with social network theory (Freeman, 1979; Levitt and March, 1988; Wasserman and Faust, 1994), in business networks the actors are distributed as nodes, and are connected with each other through tied 'relationships' (see section 2.5.3). Typically, there are a few dominant actors centrally managing these networks, acting as hubs (Wasserman and Faust, 1994). The hub is the lead organisation, linking multiple actors due to its bargaining power (Håkansson, Havila and Pederson, 1999; Hinterhuber, 2002). In this setting, small actors become vulnerable and their network survival is likely to depend on the hub and how it manages the network, especially when the goal of the network is largely built around the hub actors (Matinheikki, Rajala and Peltokorpi, 2017). Therefore, Lemmetyinen and Go (2009), amongst others (e.g., Ford *et al.*, 2003; Grönroos and Ojasalo, 2004; Claycomb and Frankwick, 2010), argue that the actors in a business network realise the value of coordinated cooperation, which increases their interdependency, establishes long-term relationships built on the interactions between them, and integrates their resources, as they see value in the relationship beyond the exchange of value propositions. In effect, small and medium sized actors in business networks can afford to manage the scale and scope of issues to mitigate their size disadvantage through network cooperation at different levels, which leads to enhancing and sustaining their competitive advantages (Bramwell and Sharman, 1999; Bieger, 2004).

Although a new actor in the business network enters the relationship with solid technological knowledge, understanding the relevance of this technology to other actors in the network requires collaboration, achieved through the actor's interaction in the network and engagement in the relationships (La Rocca and Snehota, 2014). For instance, when entering a new business network, innovation-based start-ups tend to underestimate the importance of investing in collaboration and developing network intimacy (Schutjens and Stam, 2003; La Rocca and Snehota, 2014). Therefore, actors' interface with and evaluate the other actors in the business network in terms of competences and resources, as these represent the actor's capability to contribute to the value co-creation process (Ojasalo, 2004; Gummesson and Mele, 2010).

The hubs create new technologies connected to different fields and recognise emerging business, knowledge and technological opportunities more efficiently than smaller actors, who are highly specialised in a specific sector (Powell, Koput and Smith-Doerr, 1996; Kogut, 2000). The direct and indirect relationships between the hub and other actors give the business network the ability to gain access to external resources from other business networks controlled by other actors (Lechner, Dowling and Welpe, 2006; Ciabuschi, Perna and Snehota, 2012; La Rocca and Snehota, 2014). Moreover, actors are exposed to innovative ideas in the network through interaction with major organisations that are linked with different business networks, which increases their chances of exposure to different perspectives, knowledge, and new ideas emerging from internal or external actors (Kogut, 2000; Håkansson and Ford, 2002). This discussion is related to two derivations of social network theory, namely SWT theory (Granovetter, 1973) and structural holes theory (Burt, 1992), which will be discussed in detail in section 2.5.3.

Furthermore, actors who are working in technology and research networks have the advantage of early exposure to innovations and new ideas; these networks serve as 'hotspots' for innovation in the network (Möller, 2010). Therefore, value co-creation based on participation and interaction among all actors is crucial in co-creating value. Subsequently, most actors in the network represent different entities and they will never have a direct connection with all the actors in the network, such as NGOs, and public and private organisations (Möller and Svahn, 2006; Aarikka-Stenroos, Sandberg and Lehtimäki, 2014; Rusanen, Halinen-Kaila and Jaakkola, 2014). Therefore, numerous scholars such as Lusch and Nambisan (2015), Ramaswamy and Ozcan (2018a) and Frey, Trenz and Veit (2019) argue that the development of a platform where the interaction takes place will allow the organisation to engage with individuals and communities, using technological and human resources to maximise value for all the actors in the network and enhancing innovativeness. The following section discusses the third component of the value co-creation concept, digital engagement platforms.

2.3.3.2 Digital engagement platforms

The development of a platform, whether offline or online, such as forums, emails and conference calls, when an organisation is facing fierce competition, has been recognised by scholars as a promising innovation strategy (Prahalad and Ramaswamy, 2004; Nambisan and Baron, 2009; Romero and Molina, 2009; Di Tollo *et al.*, 2012; Hein *et al.*, 2019). The platform in the value co-creation literature is an environment in which multiple economic and social actors in the business network engage in interactive and collaborative processes to co-create value (Ramaswamy and Ozcan, 2016, 2018a).

Although actors can co-create value by interactions through F2F communications on offline platforms, not all of them can gather in the same geographical place (Edvardsson, Tronvoll and Gruber, 2011). Therefore, actors are increasingly adopting ICT to form digital engagement platforms to substitute for F2F interactions in order to adjust network strategy, as well as their strategic relationships with other actors to achieve their goals (Makarem, Mudambi and Podoshen, 2009; Breidbach and Maglio, 2016). However, Ramaswamy and Gouillart (2010) argue that the efficiency of the value co-creation process is not determined by the nature of the platform, whether it is online or offline; instead, the process depends on the design of the engagement platform itself. In essence, digital engagement platforms allow the actors to reposition themselves in the business network and manage the geographical configuration, to analyse and assess value through their own perception, and to construct new strategic capital (Lorentz, Kittipanya-Ngam and Srai, 2013; Butler and Batt, 2014). Therefore, digital engagement platforms should enable transparency, dialogue among the actors, and the ability to access numerous resources, which leads to mutual benefits and co-creates value. In fact, Frey, Trenz and Veit (2019) and Hein *et al.* (2019) argue that digital platforms (i) allow organisations to develop integrated solutions by providing value added services to the core offerings; (ii) provide the actors with integration of complementary assets; (iii) connect both sides of B2B relationships i.e., the buyer side and the supplier side; and (iv) provide the actors with the ability to interact with each other efficiently.

Furthermore, digital engagement platforms play different roles in facilitating the value co-creation process, giving the actors the ability to select which others to collaborate with, depending on their evaluation of their competences and resources (Cova and White, 2010; Nordin *et al.*, 2018). Moreover, digital engagement platforms delimit the scattered nature of the business network, and extend the boundaries for interactions among the participants in the form of ongoing dialogue, thus helping to build long-term relationships (Ostrom *et al.*, 2010). In line with the innovation research stream (e.g., Sawhney, Verona and Prandelli, 2005; Nambisan and Sawhney, 2007; Gummesson and Mele, 2010), the interactional nature of digital engagement platforms leverages connectivity among actors, and enhances innovation performance through value co-creation between the actors engaging in one-to-many or many-to-many communication on the platform.

Digital engagement platforms are usually developed by the lead actors/hubs in the business networks, as they take responsibility for managing the interactions (governance) and coordinate the actors during the value co-creation process (Windahl and Lakemond, 2006; Pagani and Pardo, 2017). Actors' tendency to collaborate on their resources and competences with other actors across all stages of the value co-creation process for innovation determines the scope of the value co-created (Hoyer *et al.*, 2010; Perks *et al.*, 2017). The propensity for actors' participation in the co-creation process depends on their perception of what resources are required, and what resources they expect to gain. That is, the digital engagement platform should provide clarity to all actors in the network about the way value is captured among them and co-created, which is important when the lead organisation has limited influence on the actors, but relies on them.

Vargo and Lusch (2008a) and Macdonald, Kleinaltenkamp and Wilson (2016) argue that the value of the digital engagement platform determined by the actors is based on its ability to facilitate the value co-creation process in order to achieve their goals, by enabling an innovative combination of the offerings, as well as applying new types of knowledge and competences to the network. In addition, the key role of the digital engagement platform is to enable resource collaborations among the actors, while still ensuring their understanding of which resources they expect to integrate and which they will gain (Pagani and Pardo, 2017; Perks *et al.*, 2017).

It is worth noting here before proceeding with the next section, that regardless of the rapid proliferation of the value co-creation concept in recent years, the issue of the lack of agreement in defining value co-creation is surprisingly still present in the literature, despite the various attempts and multiple reviews (e.g., McColl-Kennedy *et al.*, 2012; Ranjan and Read, 2016) discussed in the previous sections. Ramaswamy and Ozcan (2018b) noted the confusion in defining value co-creation, and therefore attempted to provide a comprehensive definition based on the recent development in the value co-creation literature. They define co-creation as *"enactment of interactional creation across interactive system-environments (afforded by interactive platforms), entailing agencing engagements and structuring organizations"* (p. 200). This definition of co-creation is in alignment with the recent development of the S-D logic perspective of value co-creation, that value is co-created within digital engagement platforms among a multiplicity of actors (see Vargo and Lusch, 2017; Ng and Vargo, 2018; Vargo, 2018). The following section discusses in detail the changes and developments in the S-D logic perspective, from its inception in 2004 to date.

2.4 Changes and developments in the service-dominant (S-D) logic perspective

As previously mentioned, the S-D logic perspective was first introduced by Vargo and Lusch (2004) as an initiative to advance service science (Maglio and Spohrer, 2008) and as a substitute for G-D logic. According to Zeithaml, Parasuraman and Berry (1985), the distinction between services and goods provided by the G-D logic is further reinforced by other defining characteristics. These include (i) mandatory customer presence during service delivery, i.e., 'inseparability'; (ii) variation in the quality of service provision, not only between providers, but also between employees within the same organisation, i.e., ‘heterogeneity’; and (iii) services that cannot be stored, i.e., ‘perishability’. G-D logic contends that *“…goods production and distribution practices should be modified to deal with the differences between tangible goods and services”* (Vargo and Lusch, 2008a, p. 254). As shown in Table 2.2, unlike G-D logic, the S-D logic perspective considers goods as appliances/vehicles for service provision; i.e., *“conveyors of competences”* (Vargo and Lusch, 2008a, p. 256). In this light, several scholars such as Lusch, Vargo and O’Brien (2007), Vargo (2008), Vargo and Lusch (2008b, 2011, 2016, 2017), Vargo, Maglio and Akaka (2008) Akaka, Vargo and Lusch (2013), Barrett *et al.* (2015) and Mele, Sebastiani and Corsaro (2019) argue that organisations apply their knowledge and skills and that both are conceptualised as ‘service’ in the production of goods. Customers also create their value by applying their integrated resources such as knowledge, skills and money, i.e., service, during the use of the goods.

For this reason, Vargo and Lusch (2017, p. 47) posit that *“marketing activity (and economic activity in general) is best understood in terms of service-for-service exchange, rather than exchange in terms of goods- for-goods or goods-for-money”*. Accordingly, the S-D logic perspective removes the distinction between ‘goods’ and ‘services’ and asserts that the roles of organisations and consumers in creating value are not distinct either, as was emphasised by G-D logic. Instead, organisations and customers actively play both the roles of ‘producers’ and ‘beneficiaries’ and reciprocally to create value. In other words, the conceptualisation of ‘service’ is the critical distinction between G-D logic and S-D logic; the latter defines ‘service’ as the application of operant resources such as information, skills, knowledge, expertise and feedback, for the mutual benefit for multiple parties. On the other hand, ‘service’ is seen as a unit of output in G-D logic: *“S-D logic sees service as a process — doing something for another party”* (Vargo and Lusch, 2008a, p. 256).

In addition, as shown in Table 2.2, a key difference between S-D logic and G-D logic is that the former uses the term ‘service’ in the singular form, whereas G-D logic uses it in the plural, representing the shift in actors’ focus from operand resources towards operant ones (Vargo and Lusch, 2008a). By adopting the ‘process’ meaning of ‘service’, S-D logic abandons the conceptualisation of ‘service’ as a unit of output that is manifested in G-D logic from the beginning of the production orientation *“that had grown out of neoclassical economics and the concerns of the Industrial Revolution”* (Vargo and Lusch, 2017, p. 47).

Table 2.2: G-D logic versus S-D logic in value creation.

Criterion	G-D logic	S-D logic
Value driver	Value-in-exchange	Value-in-use or value-in-context
Creators of value	The firm, often with input from firms in a supply chain	The firm, network partners and customers
Process of value creation	Firms embed value in 'goods' or 'services'; value is 'added' by enhancing or increasing attributes	Firms propose value through market offerings; customers continue the value-creation process through use
Purpose of value	Increases wealth for the firm	Increases adaptability, survivability and system wellbeing through the service (applied knowledge and skills) of others
Measurement of value	The amount of nominal value; the price received in exchange	The adaptability and survivability of the beneficiary system
Resources used	Primarily operand resources	Primarily operant resources, sometimes transferred by embedding them in operand resources-goods
Role of the firm	To produce and distribute value	To propose and co-create value; to provide services
Role of goods	Units of output; operand resources that are embedded with value	Vehicle for operant resources, enabling access to the benefits of firm competences
Role of customers	To 'use up' or 'destroy' value created by the firm	To co-create value through the integration of firm-provided resources with other private and public resources

Source: Adapted from Vargo, Maglio and Akaka (2008, p. 148).

Since its introduction, some of the FPs of the S-D logic perspective have changed according to the changes in S-D logic development; that is, (i) the process of zooming out from micro-level dyadic relationships to a more realistic, dynamic and holistic view, i.e., macro-level multi-actor relationships (Vargo and Lusch, 2017); and (ii) the modification of 'value-in-use' to 'value-in-context' (Chandler and Vargo, 2011; Vargo and Lusch, 2016). In fact, S-D logic has reduced its FPs from eleven by converting five of them (FP1; FP6; FP9; FP10; FP11) into five axioms (see Table 2.3), from which the remaining FPs are derived (Vargo and Lusch, 2017). Although some of these changes have already been mentioned in earlier sections, it is necessary to elaborate on them and connect them to the FPs of the S-D logic perspective. This connection to the FPs will add more clarity on how the S-D logic perspective is still developing, creating a chance for further theoretical contributions that the current research aims to provide.

Vargo and Lusch (2016) acknowledge that there are many misunderstandings about the value co-creation concept and misinterpretations of the FPs of the S-D logic perspective amongst scholars and practitioners. They attribute these to the following reasons. First, the different definitions of value co-creation provided in Appendix 2 have led to a plethora of value co-creation conceptualisations (Grönroos, Strandvik and Heinonen, 2015). In line with Lusch and Vargo (2006a), these definitions indicate that value-in-use and co-production are the main elements of the value co-creation process. Ranjan and Read (2016) define co-production as the involvement of customers in one or more of the various activities related to the production and development of the value propositions. These two elements are argued to broadly describe value co-creation as a cumulative effect of collaborative competences amongst actors. However, whilst they are nested concepts and closely related to the value co-creation concept, they should not be considered the same (Lusch and Vargo, 2006b, 2006a).

Vargo and Lusch (2004, 2008b, 2008a) and Lusch and Vargo (2006b, 2014) distinguish between co-production and value co-creation. As shown in Table 2.2, co-production is mainly related to G-D logic. Scholars such as Lusch, Vargo and O'Brien (2007), Hoyer *et al.* (2010) and Russo-Spena and Mele (2012) argue that co-production requires actors' participation in the creation of the core product in the form of co-ideation, co-valuation, co-design, co-testing and co-launching. In essence, actors` participation is limited to the productive (creative) activities of offerings. According to Vargo and Lusch (2016), the issue of using the term 'co-production' implies that the organisation should always involve the customer at all stages of value proposition creation and development.

In reality, co-production with customers is optional and subject to many factors, such as customer competences such as knowledge and skills. Value co-creation, however, encompasses a broader scope of contributions, including the integration of resources, as well as collaborative interactions during the consumption of the offering (Vargo and Lusch, 2004). Put differently, value co-creation is characterised by interdependency and specialisation, and as such value is always co-created, *"hence, cocreation of value, unlike co-production, is not optional"* (Vargo and Lusch, 2016, p. 9). Further, Vargo and Lusch (2016) state that the extent of value co-creation has been drastically understated since the emergence of the value co-creation concept and S-D logic. Specifically, the original FP6 and its corrected version in Vargo and Lusch (2008b) inadvertently implied that value co-creation is dyadic (see Table 2.3).

On the contrary, as argued by Vargo and Lusch (2016), and in line with the actor-to-actor (A2A) concept (Håkansson and Snehota, 1995) and network and system theorists (e.g., Parkhe, Wasserman and Ralston, 2006; Borgatti and Halgin, 2011; Borgatti, Brass and Halgin, 2014), value co-creation *"is neither singular nor dyadic but rather a multi-actor phenomenon"* (p.9). In other words, value co-creation does not just take place in the activities of a single actor (Vargo and Lusch, 2017; Ramaswamy and Ozcan, 2018b), or even in the dyad between the organisation and customers, but rather in the integration of resources by multiple actors in the business network. As shown in Table 2.3, this view of value co-creation is indicated in the recent version of FP6: *"Value is cocreated by multiple actors, always including the beneficiary"* (Vargo and Lusch, 2016, p. 8).

Second, in the early stages of the development of the S-D logic perspective, besides 'co-production' and 'value-in-use' terminology, 'customer orientation' was used in the formulation of its original FPs. Scholars such as Hunt and Morgan (1995) and Johnstone, Dainty and Wilkinson (2009) define customer orientation as the organisation`s focus on its customers` needs, by performing groups of actions to meet and/or exceed their expectations to achieve customer satisfaction. The use of such terminology was appropriate for the original purposes of the S-D logic perspective, when the focus was on customer orientation and limited to dyadic relationships (Vargo and Lusch, 2016). However, Vargo and Lusch (2016) argue that the use of the 'co-production' and 'customer orientation' terms in the original FPs in Vargo and Lusch (2004, pp. 10–11), namely

(i) FP6 - *"The customer is always a co-producer"*
(ii) FP8 - *"A service-centred view is customer oriented and relational"*

Which were later amended in Vargo and Lusch (2008b, p. 7) to:

(i) FP6 - *"The customer is always a co-creator of value"*
(ii) and FP8 - *"A service-centred view is inherently customer oriented and relational"*

has created much misunderstanding of the value co-creation concept and misinterpretation of S-D logic FPs amongst scholars and practitioners.

Moreover, as shown in Table 2.3, the original FP8, *"A service-centred view is customer-oriented and relational"*, implies that value co-creation is customer-oriented; however, the definition of value co-creation indicates that the value co-creation process aims for the benefit for all beneficiaries, and *"no consumer orientation"* (Vargo and Lusch, 2016, p. 10). Further, as shown in Table 2.3, FP1 implies that *"Service is the fundamental basis of exchange"*; that is, a service is the basis of all exchange (Vargo, Lusch and Akaka, 2010). In effect, Vargo and Lusch (2016) argue that the term 'beneficiary' centres the discussion on the recipient of the value propositions and through the integrated resources, as such the referent of value co-creation. Therefore, as can be seen in Table 2.3, FP8 was corrected to *"A service-centered view is inherently beneficiary oriented and relational"*.

Table 2.3: S-D logic perspective foundational premises (FPs).

FP1 **(Axiom1)**	Service is the fundamental basis of exchange.
FP2	Indirect exchange masks the fundamental basis of exchange.
FP3	Goods are distribution mechanisms for service provision.
FP4	Operant resources are the fundamental source of strategic benefit.
FP5	All economies are service economies.
FP6 **(Axiom2)**	Value is co-created by multiple actors, always including the beneficiary.
FP7	Actors cannot deliver value but can participate in the creation and offering of value propositions.
FP8	A service-cantered view is inherently beneficiary oriented and relational.
FP9 **(Axiom3)**	All social and economic actors are resource integrators.
FP10 **(Axiom4)**	Value is always uniquely and phenomenologically determined by the beneficiary.
FP11 **(Axiom5)**	Value co-creation is coordinated through actor-generated institutions and institutional arrangements.

Source: Adapted from Vargo and Lusch (2016, p.8).

A shown in Table 2.3, and in line with the A2A concept and social network theory, the S-D logic perspective implies the 'network structure' of value co-creation, that is:

(i) FP6 (Axiom 2) *"Value is cocreated by multiple actors, always including the beneficiary"*

(ii) FP9 (Axiom 3): *"All social and economic actors are resource integrators"*

(iii) FP10 (Axiom 4): *"Value is always uniquely and phenomenologically determined by the beneficiary",* which implicates the 'contextual nature' of value co-creation.

The above three FPs together imply several issues. First, they assert that the resources (at least in part) required for value propositions come from other actors in the business network, consequently confirming that value co-creation occurs in business networks. Second, value is created for multiple actors in the business network, including not only customer-supplier or customer-provider in dyadic relationships, but with multi-actors. Finally, S-D logic perspective implies the dynamic component of the business network, since each resource integration and knowledge flow *"changes the nature of the network in some way"* (Vargo and Lusch, 2016, p. 7).

It should be noted here that openness to the external environment to gain new ideas and resources positions value co-creation in line with Chesbrough`s (2003) pioneering work on open innovation (Maciuliene and Skaržauskiene, 2016). Chesbrough and Bogers (2014) define open innovation as *"a distributed innovation process based on purposively managed knowledge flows across organizational boundaries"* (p. 17). These similarities may create confusion between the value co-creation concept and open innovation. Therefore, it is worth distinguishing between value co-creation and open innovation. Open innovation emphasises organisations' use of internal and external sources for idea generation, and implies the need for combining internal and external ideas, information and knowledge flow in systems and platforms to advance organisations' innovations (Bogers, Chesbrough and Moedas, 2018). In essence, value co-creation and open innovation are similar concepts; however, they differ in scope and focus (Enkel, Gassmann and Chesbrough, 2009).

In open innovation, the knowledge flow from both internal and external paths is not constrained to the organisation's business network. In other words, open innovation represents a relatively broad scope in gathering information and ideas from sources outside the organisation's ecosystem/business network, and largely focuses on innovation (Vanhaverbeke and Cloodt, 2006; Bogers, Chesbrough and Moedas, 2018). Conversely, since the locus of value co-creation is 'value', knowledge and idea flows are constrained inside the business networks amongst the actors in the value co-creation process (Frow *et al.*, 2015). Moreover, value co-creation includes an array of activities and focuses on knowledge and relational outcomes besides innovation (Reypens, Lievens and Blazevic, 2016).

To this end, S-D logic perspective emphasises the business network context of value co-creation, where various actors are directly and indirectly connected to each other, to the extent that they become dependent and interdependent through a network of personal and business relationships that transcend transactional relationships and economic exchange. Therefore, the value co-creation process must be understood in a business network context of relationships (Vargo and Lusch, 2017): *"Understanding the service ecosystems nature of relationships should be a managerial, and thus a research, priority"* (Vargo and Lusch, 2010, p. 177). The following section discusses in detail the three aspects of value co-creation in business networks: (i) the DART model; (ii) networking capability; and (iii) network position.

2.5 The three aspects of value co-creation in business networks

This section discusses the three aspects of value co-creation enabled by digital engagement platforms in which numerous actors participate in the process. In more detail, sub-section 2.5.1 discusses the various attempts to develop a framework/model for the value co-creation process. It discusses four theoretical and conceptual frameworks, namely; the conceptual model offered by Payne, Storbacka and Frow (2008), which consists of three parts - (i) customer processes, (ii) supplier processes, and (iii) encounter processes; Grönroos and Voima`s (2013) "spheres of value co-creation" framework; the customer value co-creation behaviour framework proposed by Yi and Gong (2013); and the DART model developed by Prahalad and Ramaswamy (2004). This sub-section then discusses in detail the four components of the DART model. Sub-section 2.5.2 moves the discussion onto the antecedents of the value co-creation process derived from the literature review in the B2B context, with a focus on networking capability. The final sub-section (2.5.3) provides an overview of the notion of network position through the lens of social network theory, and how network position contributes towards actors' ability to manage their relationship portfolio, which in turn enhances their ability to access network resources, and as such improves firm innovativeness.

2.5.1 The value co-creation process models and frameworks

In line with earlier contributions (e.g., Prahalad and Ramaswamy, 2000; Vargo and Lusch, 2004), scholars have attempted to develop a framework for the value co-creation process; the DART model was the first attempt proposed by Prahalad and Ramaswamy (2004). DART was driven by the advances in ICT that enabled global consumers and other stakeholders to engage in relationships with other actors, as well as empowering customers in emergent heterogeneous markets to make more informed purchase decisions (Ramaswamy and Gouvillart, 2010; Di Tollo *et al.*, 2012).

Payne, Storbacka and Frow (2008) developed another conceptual framework for service organisations based on customer behaviour, cognition and the goal of engaging in the value co-creation process with service providers (Appendix 3). Payne, Storbacka and Frow`s (2008) conceptual framework divides the value co-creation process into three main components, namely customer, supplier, and encounter processes. The customer value-creating processes are also divided into two parts, B2C, and B2B. In the B2C relationship, the customer processes consist of the practices and resources customers employ to manage their activities aiming to achieve a particular goal. On the other hand, in B2B the value creation activities comprise the activities performed by customer organisations to manage their relationships with suppliers. The supplier value-creating processes are the practices and resources used by suppliers to manage and organise their relationships with customers and other stakeholders relevant to their businesses. Finally, encounter processes take place between the supplier and customers, formed by a series of interactions and exchange processes that needs to be managed in order to support the centrality of interactions in value co-creation.

Consequently, Grönroos and Voima (2013) developed a conceptual framework concerned with the interaction between customers and suppliers; the framework was based on "spheres of value co-creation" (Appendix 4) consisting of three spheres, namely the customer sphere, provider sphere and joint sphere. The spheres of value co-creation framework focuses on providers' and customers' roles in the value co-creation process, and considers both as creators of value (Grönroos and Voima, 2013). In the provider sphere, the supplier provides customers with value propositions (potential value-in-use), which will later be turned into real value (value-in-use), aiming to facilitate customer value creation. The customer sphere, on the other hand, is the place where the value-in-use is created independently by customers through the indirect interaction between their resources and experiences, and the provider's resources. Hence, organisations aim to enhance their competitiveness by engaging with customers in direct interactions to co-create value, which will have a positive impact on customer satisfaction and loyalty (Hoyer *et al.*, 2010; Atakan, Bagozzi and Yoon, 2014). Grönroos and Voima (2013) argue that the direct interactions between customers and organisations emerge from a dialogical process, resulting in the value co-creation that occurs reciprocally in the joint sphere.

Applying a mixed-method approach using in-depth interviews and SEM to analyse data obtained from 153 undergraduate students, Yi and Gong (2013) attempted to develop a framework and measurement scale for customer value co-creation behaviour. Specifically, their value co-creation framework focuses on the value co-creation process from the customer perspective, proposing a measurement scale comprising customer behaviour (i.e., participation and citizenship behaviour) in the value co-creation process. In more detail, they argue that the value co-creation process, referred to as "the value co-creation behaviour" in their research, is formed by (i) information seeking - information about their role in the value co-creation process; (ii) information sharing - active participation and knowledge transmission; (iii) responsible behaviour - cooperation, following the guidelines and common goals; (iv) personal interaction required to develop courtesy, friendliness and respect, which all lead to trust; (v) feedback – pertaining to customers' input into the value co-creation process, such as suggestions and orientations; (vi) advocacy, which is not directly related to value co-creation, but according to Yi and Gong (2013) contributes towards building the organisation`s reputation; (vii) helping - the customer plays the role of an employee to help other customers regarding the value propositions, without direct interference from the organisation; and (viii) tolerance, referring to *"customer willingness to be patient when the service delivery does not meet the customer's expectations of adequate service, as in the case of delays or equipment shortages"* (Yi and Gong, 2013, p. 1281). Table 2.4 summarises the four value co-creation process models/frameworks and gives their pros and cons.

Table 2.4: Value co-creation process - Models and frameworks.

Model/ Framework	Author(s)	Pros	Cons
DART	Prahalad and Ramaswamy (2004)	• Takes into consideration both B2C and B2B relationships • Determines the building blocks of interactions for value co-creation • Focuses on value-in-experience	• Confined to dyadic relationships
Conceptual framework for value creation	Payne, Storbacka and Frow (2008)	• Explains how companies can manage value co-creation in B2C markets • Includes the encounter process that demonstrates the mutual learning process	• There is a distinction and separation between the B2C and B2B contexts (no integration of activities)
Spheres of value co-creation	Grönroos and Voima (2013)	• It emphasises the critical role of suppliers as "facilitators" of value co-creation, and that of customers as value co-creators	• Does not take into consideration the B2B relationships • Sees customers as "co-producers" at the moment of value proposition delivery/consumption • Mainly focuses on services, with little application to goods
Customer value co-creation behaviour	Yi and Gong (2013)	• Proposes a measurement scale comprising customer behaviour (i.e., participation and citizenship behaviour)	• Only focused on value co-creation from the customer perspective • Not all components are directly related to value co-creation; e.g., advocacy

Source: Own elaboration

The three aforementioned frameworks employ the perspective of organisations on value co-creation, as well as the opportunities provided by ICT to create new ways for them to facilitate customers' engagement in co-creating innovative value propositions. By enabling open dialogue, customers can contribute their knowledge and experience to the generation of ideas and development of value propositions (Füller *et al.*, 2009). Therefore, the open dialogue during the value co-creation process provides the opportunity for developing and strengthening the relational bonds between organisations and their customers in order to enhance the innovation performance (Nambisan and Baron, 2009; Mahr, Lievens and Blazevic, 2014).

Although DART is not the only theoretical framework for conceptualising the value co-creation process between organisations and customers, it remains the most appreciated one for value co-creation (Taghizadeh *et al.*, 2016), since it not only focuses on the relationships between organisation and customers for value co-creation, but also takes into account other stakeholders such as business partners, competitors and independent inventors (Prahalad and Ramaswamy, 2004; Randall and Leavy, 2014). As a result, we argue that the DART model is applicable beyond the B2C and B2B dyads to examine inter-organisational relationships in business networks. Therefore, in this research, it is proposed as a framework that captures and conceptualises the technology-enabled value co-creation process in business networks and is used to empirically test the conceptualisation of the research.

2.5.1.1 Dialogue

Dialogue is the first building block for interaction in value co-creation, and is not only considered as the most significant element of DART in the value co-creation literature (e.g., Prahalad and Ramaswamy, 2004), but also in different fields of marketing, such as interactive marketing and relationship marketing (e.g., Morgan and Hunt, 1994; Kotler, 2000; Kotler and Pfoertsch, 2006; Kapferer, 2008). Dialogue for value co-creation goes beyond merely involving the actors in communication activities (Grönroos and Ojasalo, 2004); for instance, dialogue through monologue channels such as advertisements, where the two ends of communication never actually meet, and which in turn constrains the ability to create shared meaning and accurate interpretation of value (Kotler, 2000).

According to Prahalad and Ramaswamy (2004), dialogue is essential for building common understanding among actors by facilitating free and open communications. Dialogue involves issues of interest to all parties and allows the formation of shared meanings. In fact, Nambisan and Baron (2009) and Mahr, Lievens and Blazevic (2014) argue that open dialogue reinforces the relationships between actors; as such, it requires deep engagement with clearly defined rules, and lively activity among the actors, as well as the willingness to act upon the information received, particularly when the actors are at odds (Maglio and Spohrer, 2008). Hence, the flow of information among the actors is no longer uni-dimensional.

Further, taking the perspective of the theory of channel communication (Mohr and Nevin, 1990), Mohr, Fisher and Nevin (1996) assert the significant role of dialogue amongst actors in creating an environment of trust, mutual understanding and support and volitional compliance with common objectives. This in turn creates more symmetrical power conditions in the business network, and enhances the outcomes of the collaborative effort, such as (i) coordination of activities and (ii) commitment to and satisfaction with the collaborative process. In this respect, Prahalad and Ramaswamy (2004, p. 9) emphasise that the dialogue between actors is characterised by *“interactivity, deep engagement, and the ability and willingness to act on both sides”*. The dynamic nature of dialogue implies that it is a process of mutual learning and understanding that goes beyond simply understanding one another to uncover the hidden insights and perspectives of the goal of the relationships between the engaged actors (Ballantyne, 2004). Therefore, marketers are increasingly stretching the monologue channels into interactive dialogue ones, using a variety of communication platforms such as live chat, call centres, online brand communities, emails, forums, and toll-free numbers (Kotler, 2000; Kotler and Armstrong, 2010) by accessing common meanings to build *reasoning together* (Schein, 1993; Ballantyne, 2004).

In other words, dialogue gives the opportunity for actors in the business network to include their input (knowledge, skills and information), as well as their views about value, into the value co-creation process. Moreover, dialogue not only encourages empathetic understanding and lively interaction among the actors in the business network, but also induces timely engagement in the value co-creation process (Prahalad and Ramaswamy, 2004; Lusch, Vargo and Gustafsson, 2016). Through enabling dialogue, the actors can contribute their knowledge, experience and skills in order to generate new ideas that enhance innovativeness (Ballantyne and Varey, 2008; Füller *et al.*, 2009).

Given the above discussion, flexibility, connectivity and interactivity are the order of the day in the highly competitive and rapidly developing business environment. The simple recognition made by the DCV of the firm and the emergent S-D logic perspective (Helfat *et al.*, 2007; Teece, 2007; Vargo and Lusch, 2017), that more can be achieved, and that value can be co-created with and for all actors by working together, has led to more open multi-directional communications between actors. The successful collaboration aimed at value co-creation cannot take place without meaningful and interactive dialogue. In particular, dialogue between actors goes beyond simple resource allocations, division of tasks, and exploitation of existing relationships. Such dialogue is more about fostering meaningful communications and a genuine determination by all the engaged actors in the value co-creation process to (i) clearly define roles and create mutual awareness of what needs to be done; (ii) reach a common understanding of what constitutes value to them and their customers; (iii) develop shared meanings in order to build consensus; (iv) construct a common strategic objective; and (v) to share knowledge, insights, resources, and learning. In other words, dialogue is the pathway to new business knowledge (Ballantyne, 2004) new ideas, and resources.

2.5.1.2 Access

Access relates to actors accessing a wide range of operant resources. Through their interactions, they can recognise that timely access to such resources is crucial for value co-creation (Breidbach and Maglio, 2016). Access indicates the availability and reach of resources, knowledge and information for the participating actors in the value co-creation process (Prahalad and Ramaswamy, 2004). Granting open access to actors allows them to understand and analyse the potential risks they will face, and the potential benefits they will gain from engaging in the value co-creation process (Maglio and Spohrer, 2008).

Indeed, access to resources (operant and/or operand) by the actors in business networks has been argued to be a motive for participating in value co-creation in different contexts, such as outsourcing (Sinkovics, Kuivalainen and Roath, 2018); crowdsourcing (Estellés-Arolas and González-Ladrón-de-Guevara, 2012); business networks (Ekman, Raggio and Thompson, 2016); open innovation (Chesbrough and Bogers, 2014), and resource integration (Lusch and Vargo, 2014). In fact, the interest in 'access to resources' in different contexts goes back to the fact that organisations seek to attain competitive advantage by acquiring rare resources and capabilities; however, these resources might be possessed by other actors in the business network (Teece, 2007; Helfat and Raubitschek, 2018).

Nonetheless, because actors are not fully independent in the business network, Newbert (2008) and Ramaswamy and Ozcan (2018b) emphasise that actors should seek collaboration and resource integration to co-create value among them using the resources and capabilities already possessed. In other words, actors do not necessarily need to possess unique and/or rare resources and capabilities, nor the mere exploitation of operant resources that other actors in the business network possess. Instead, integrating the operant resources through dynamic and ongoing relationships in a way that grants the actors access to the different resources and capabilities will result in new resources (Akaka, Vargo and Lusch, 2013; Vargo and Lusch, 2017). Therefore, Albinsson, Perera and Sautter (2016) and Quinton and Wilson (2016) argue that actors' access to intangible resources (i.e., knowledge, skills, information, expertise and technology) indicates the ability of the organisation to determine how, when and where they are provided with the opportunity to engage in the value co-creation process. In addition, access as a component of DART denotes actors' ability to access the value and participate in the experience of co-creating it without the ownership of a physical product (Kingston, 2004; Borges *et al.*, 2016).

It is worth noting that findings from the research on the impact of increased access to resources (referred to as 'slack resources' in the management literature), whether internally within the organisation or externally within the business network, on innovation have been rather contradictory. For instance, the vast majority of scholars (e.g., Camisón-Zornoza *et al.*, 2004; Hult, Hurley and Knight, 2004; Laursen and Salter, 2006; Goodman, Korsunova and Halme, 2017; Desai, 2018; Raut, 2018) suggest that having access to an abundance of resources supports creativity and innovation. The emphasis here is that when actors have more channels for accessing new or valuable resources and novel ideas, which were previously inaccessible due to various constraints such as financial capacity, firm size, underdeveloped expertise, and the cost of acquiring or possessing the resources, they will become more innovative, which in turn will enhance their overall performance.

On the other hand, proponents of this view, such as Nohria and Gulati (1997), argue that the slack-innovation relationship is negative (Demirkan, 2018), or has an inverse U shape (Nohria and Gulati, 1997). Nohria and Gulati (1997) emphasise that ready access to resources that are often available may create conditions of opportunism and undisciplined management of them, leading to negative innovation outcomes. Opportunistic behaviour or opportunism "*is a variety of self-interest seeking but extends simple self-interest seeking to include self-interest seeking with guile*" (Williamson, 1979, p. 234). Put differently, opportunism entails exploiting benefits from collaborative relationships opportunistically (Hennart, Roehl and Zietlow, 1999; Mitrega *et al.*, 2012).

Conversely, scholars such as Goldenberg, Lehmann and Mazursky (2001), Mishina, Pollock and Porac (2004) and Hoegl, Gibbert and Mazursky (2008) posit that it is resource constraints that enable organisations to be more innovative. They argue that the presence of slack resources is an indicator of an organisation`s inefficiency, which in turn might be translated into a lack of innovative spirit. Hence, when organisations have fewer resources, they must improve their innovativeness and are more likely to recognise innovation opportunities and come up with novel and unexpected ideas. In fact, Hoegl, Gibbert and Mazursky (2008) label the resources-innovation relationship as 'less is more'. Daniel *et al.* (2004) imply that the ambiguity of the slack resources-innovation relationship is due to the fact that a large number of scholars have hypothesised that the slack resources-innovation relationship is *"based primarily on anecdotal rather than empirical evidence"* (p. 565).

To this end, the willingness of actors to play an active role in the value co-creation process through 'dialogue' and 'access' indicates that the organisation is revealing more information regarding the associated risks of their value propositions. Accordingly, the actors (including customers) are obliged to play a role and be responsible for assessing the associated risks and expected benefits related to the value co-creation outcomes (Prahalad and Ramaswamy, 2004).

2.5.1.3 Risk/benefit assessment

The third building block of the DART model refers to the assessment of the risks and benefits associated with actors` value propositions and the economic transactions between them (Prahalad and Ramaswamy, 2004). Cao and Song (2016) posit that there are four risk factors that actors in the business network face associated with the value co-creation process, namely (i) corporation management risk, (ii) capacity risk (from the customer side), (iii) supply risk, and (iv) market risk.

Corporation management risks include coordination of the collaborative relationships between the participants in value co-creation and the difficulties associated with knowledge sharing, financial risks and decentralisation of decision making (Holweg *et al.*, 2005; Karpen, Bove and Lukas, 2012). The capacity risk on the customer side of the relationship involves customers' limited expertise, as well as their capability to articulate their needs and wants regarding the value propositions (Cao and Song, 2016). Cao and Song (2016) also argue that capacity risk concerns customers' ability to effectively assess the organisation's technical norms and capacity to produce, design and deliver value propositions that reach or exceed customer expectations.

On the other hand, Karpen, Bove and Lukas (2012) and Chaudhuri, Mohanty and Singh (2013) assert that supply risk denotes the degree of the provider's (for services) and/or supplier's (for tangible products) involvement in the value co-creation process, as well as the ability to cope with rapid changes in business practices. Finally, market risk relates to the development of value propositions that are only suitable for niche markets due to the involvement of customers and other stakeholders, such as retailers and wholesalers who are distributed across different markets (Callahan and Lasry, 2004; Amini *et al.*, 2012).

Taking the RV of competitive advantage, Dyer and Singh (1998) argue that collaboration among actors encompasses a degree of competition, which in turn might lead to role ambiguity or conflict in the value co-creation process. Similarly, Mitrega *et al.* (2017) emphasise that interactions among actors are often associated with other sources of risk, such as the misuse of resources by some; for example, opportunistic behaviour, conflicts of interest, or the challenges of the shared decision-making process. In effect, having access to confidential and important information about actors' offerings and competences leads to more accurate assessments of the risks and benefits. This in turn requires the actors to be transparent regarding their abilities, competences, and risks associated with their value propositions.

2.5.1.4 Transparency

Transparency refers to the condition of actors being ‘explicit’ and ‘open’, which is considered a critical component of the value co-creation process as it builds trust (Ramaswamy and Ozcan, 2016; Desai, 2018). Transparency denotes openness and symmetry of information among the actors and could include a simple action such as sharing information related to the risk/benefits of the product/service attributes, usage or consumption, or more complex actions such as sharing critical information about actors’ capabilities, skills, product design and service processes (Walter, Auer and Ritter, 2006; Marcos-Cuevas *et al.*, 2016).

Ramaswamy and Gouillart (2010) argue that transparency in the interactions between actors is necessary to create trust among them; indeed, hiding business or technological information required for the value co-creation process can jeopardise such trust. In essence, transparency is an indication of the actors’ integrity (Michel, Brown and Gallan, 2008), and commitment to information symmetry for value co-creation, which provides clarity in their roles in co-creating value. Therefore, Srinivasan (2005) and Mitrega *et al.* (2017), among others, emphasise that it is imperative to establish ethical approaches to exchanging the operant resources that have been made accessible by the actors. Furthermore, transparency is essential for avoiding the risks of misusing the operant resources which have been made accessible (Madhok and Tallman, 1998; Nardelli and Broumels, 2018).

It can be seen from the studies discussed above that the literature has provided various frameworks that conceptualise the value co-creation process. Despite this variety in value co-creation process frameworks, they all revolve around the idea that interactions and resource integration are the loci of the value co-creation process. The current research aims to shed light on how resource integration occurs in a technology-enabled value co-creation process in business networks by expanding the use of the DART model to make it applicable to the business network context. We argued in Chapter 1 (Introduction) that the DART model can be extended to capture this process by incorporating networking capability as an antecedent to the DART model. The expansion of the model will optimise organisations’ abilities in effective and timely resource allocation and integration, leading to better time-saving and cost-effective practices for value co-creation.

The following section discusses the antecedents of the value co-creation process in the B2B setting and the reasons for choosing networking capability as an antecedent of the value co-creation process in business networks from among the other antecedents.

2.5.2 Networking capability and the value co-creation process

Since the type of co-created value is value-in-context, in that it is interpreted depending on each actor's perception of what constitutes value, previous studies in value co-creation emphasise the key role of actors' motivations in engaging in the value co-creation process, and the outcomes generated by it. This section discusses the antecedents of the value co-creation process in the B2B context, with emphasis on networking capability.

Reypens, Lievens and Blazevic (2016) acknowledge that the shift from focusing on dyadic relationships to a multi-actor perspective in the value co-creation literature has motivated researchers to draw on the integration of different theoretical backgrounds and literature streams, such as the S-D logic perspective (Vargo and Lusch, 2004, 2017); innovation (Chesbrough, 2003; Enkel, Gassmann and Chesbrough, 2009); the RBV (Barney, 1991); social network theory (Granovetter, 1973; Borgatti and Halgin, 2011); stakeholder theory (Donaldson and Preston, 1995; Jones, 1995; Jones and Wicks, 1999); the RV of competitive advantage (Dyer and Singh, 1998); and the DCV of the firm (Teece, Pisano and Shuen, 1997; Teece, 2007).

The different intersections of theories examining value co-creation shed light on the antecedents of the value co-creation process (Reypens, Lievens and Blazevic, 2016). As shown in Appendix 5, the majority of antecedents of the value co-creation process focus on actors' capabilities, specifically relational and networking ones. In more detail, taking a business network perspective, Nardelli and Broumels (2018), amongst others (e.g., Kohtamäki *et al.*, 2013; Pera, Occhiocupo and Clarke, 2016; Yang *et al.*, 2018), argue that relational capability is a crucial antecedent of the value co-creation process in business networks, especially when the organisational relationships are associated with trust, commitment and openness among the actors.

According to Helfat (2007), relational capability refers to actors' capacity to create, modify or extend their resource base by accessing resources from the business network. In fact, Ramaswamy and Ozcan (2016) and Mostafa (2016) emphasise that in business networks, especially when relationships are asymmetrical, i.e., actors of different sizes and characteristics, relational capabilities play a critical role in enhancing resource exchange, dialogue and openness among actors. Similarly, Fang *et al.* (2019), together with Walter, Auer and Ritter (2006), acknowledge the embeddedness of relational capabilities in networking capability alongside other activities such as dialogue, coordination and collaboration between actors. Appendix 6 presents different definitions of networking capability derived from the literature review.

Furthermore, research on inter-organisational marketing emphasises business relationships as a vital source of resources and a primary means to achieve innovativeness and competitive advantage in business networks, (e.g., Mitrega *et al.*, 2012; Zhang *et al.*, 2015; Mostafa, 2016; Mu *et al.*, 2017; Nardelli and Broumels, 2018; Arellano, Rebolledo and Tao, 2019). Research on innovativeness (Boso *et al.*, 2013; Martínez-Román *et al.*, 2019), firm performance (Yang *et al.*, 2018; Caseiro and Coelho, 2019), innovation performance (Fang *et al.*, 2019; Garcia Martinez, Zouaghi and Sanchez Garcia, 2019), the co-creation of entrepreneurial opportunities (De Silva *et al.*, 2020), product innovation (Mitrega *et al.*, 2017), service innovation (Fu, Wang and Zhao, 2017; Nardelli and Broumels, 2018; Mele, Sebastiani and Corsaro, 2019), decision coordination in supply chain management (Yew Wong and Acur, 2010), NPD (Mitrega *et al.*, 2012; Mu *et al.*, 2017; Ozdemir *et al.*, 2020), and NSD (Ommen *et al.*, 2016) also acknowledges the importance of inter-organisational relationships, interactions and networking as an attractive means through which actors in business networks can create value

The DCV of the firm suggests that organisations should continuously reshape and combine their resources and capabilities through inter-organisational relationships in order to create and sustain competitive advantage (Helfat, 2007; Teece, 2007). Therefore, Eisenhardt and Martin (2000) emphasise that dynamic capabilities are drivers of the creation of new resources by mobilising, combining and integrating resources within inter-organisational relationships, which in turn reinforces value creation strategies. In the value co-creation context, Reypens, Lievens and Blazevic (2016) argue that dynamic capabilities allow the organisation to cope with rapidly changing environments by exploiting new resources acquired from actors in the business network, thus providing the actors engaged in the value co-creation process with the ability to identify and assess the available resources and capabilities required to enhance the value co-creation process.

As shown in Table 2.5, research on different research streams such as relationship portfolios, value creation in buyer-seller relationships, innovation performance and innovativeness, suggest that networking with key players in the business network allows actors to obtain valuable resources such as new technologies and information related to markets and new opportunities. However, Mu (2013) argues that leveraging the business network’s resources and navigating the existing and potential business relationships requires actors to develop a firm-level dynamic capability. The specific ability of dynamic capabilities to reconfigure and integrate resources makes them crucial in cases of dynamic inter-organisational relationships (Helfat, 2007; Helfat and Raubitschek, 2018). As such, Helfat (2007) and Teece (2007) assert that dynamic capabilities allow the actors in business networks to reinvest their resources from previous inter-organisational relationships, while managing new ones.

Table 2.5: Different network-focused research streams focusing on networking capability.

Research stream	Author (s)
Relationship portfolios	Cui and O`Connor (2012)
Value creation in buyer-seller relationships	Walter, Ritter and Gemüden (2001); Ford, Verreynne and Steen (2018)
Value appropriation in industrial buyer-seller relationships	Jing and Mingfei (2019)
Organisational learning	Anand and Khanna (2000)
Industrial brand equity	Zhang *et al.* (2015)
Opportunity discovery	Shu, Ren and Zheng (2018)
New venture performance	Mu (2013); O'Toole and McGrath (2018)
Firm performance	Arellano, Rebolledo and Tao (2019)
Innovation performance	Fang *et al.* (2019)
Start-ups	McGrath, Medlin and O'Toole (2019)
Innovativeness	Ahuja (2000a, 2000b)

Source: Own elaboration

Moreover, Walter, Auer and Ritter (2006) posit that relationships between the actors in business networks do not simply emerge or exist. They further argue that interactions can rarely be pre-specified, and that the transfer of expertise, skills and other intangible resources is fraught with ambiguity. What is more, inter-organisational relationships persist beyond their useful lifespan into the development of opportunistic behaviour (Hennart, Roehl and Zietlow, 1999; Wathne and Heide, 2000). Therefore, actors need to learn how to govern their relationships so as to cope with ambiguity in business relationships and the contingencies in the business network. Networking capability, by definition, therefore allows the actors to manage their relationship portfolio, and as such create and develop their network in order to gain access to the network resources that are crucial for the value propositions (Mu and Di Benedetto, 2011; Zaefarian, Forkmann, *et al.*, 2017). In addition, several scholars such Mu *et al.* (2017), Parida *et al.* (2017) and Arellano, Rebolledo and Tao (2019) recognise networking capability as a strategic resource for leveraging innovativeness. Furthermore, the broader marketing and strategic management literature posits that business relationships go through several stages, namely initiation, development and termination (e.g., Ford, 1980; Dwyer, Schurr and Oh, 1987; Schurr, Hedaa and Geersbro, 2008). In this regard, research on relationship portfolios (e.g., Mitrega *et al.*, 2017) emphasises the integrated approach of examining the different business relationship stages.

The following sub-sections explain how networking capability allows the organisation to manage these three stages, and also presents the consequences of such capability. By doing so, we further assert the importance for the actors to develop this capability in light of the increased emphasis on the connectivity and interactivity offered by ICTs.

2.5.2.1 Networking capability and relationship stages

According to Ford (1980), Dwyer, Schurr and Oh (1987) and Schurr, Hedaa and Geersbro (2008), the first stage business relationships go through during their creation is **the relationship initiation stage**. Building relationships with valuable business partners is crucial for actors' survival and growth, especially for new actors in the business network, such as start-ups and entrepreneurs (Ford and Håkansson, 2006; Forkmann *et al.*, 2016; O'Toole and McGrath, 2018). Therefore, actors constantly endeavour to enrich their relationship portfolio by systematically replacing existing business relationships with valuable new ones (Ozcan and Eisenhardt, 2009). Consequently, initiating relationships, including changing social relationships into business ones, is seen as a crucial managerial task (Gulati, 1998; Reinartz, Krafft and Hoyer, 2004). Networking capability provides actors with the ability to manage the relationship initiation stage by selecting and attracting other valuable actors by building personal relationships with them (Ritter, Wilkinson and Johnston, 2002; Jing and Mingfei, 2019). In this light, Swaminathan and Moorman (2009), amongst others (e.g., Dyer and Singh, 1998; Walter, Auer and Ritter, 2006; Mu, 2013), argue that the business network should be ambidextrous concerning the relationships between the actors. In other words, they argue that the actors should make a trade-off between the risk and benefits of their relationship portfolio. In effect, they need a balance between exploiting existing relationships and exploring new ones. Hence, networking capability allows the actors to reinforce their position in the business network through the value of ambidexterity derived from the relationship initiation stage.

The second stage is **the relationship development stage.** In this stage, the actors' aim is to maintain and strengthen the inter-organisational relationships developed in the initiation stage (Ozcan and Eisenhardt, 2009). Networking capability allows them to develop existing relationships by coordinating the communication between actors, increasing the mutual understanding between them, sharing knowledge, information, and risk/benefit assessment, and joint decision making (Walter *et al.*, 2003; Walter, Auer and Ritter, 2006; Ngugi, Johnsen and Erdélyi, 2010). Moreover, networking capability goes beyond focusing on the inter-organisational business relationships among actors to the development of interpersonal relationships, which is also in line with social capital theory (Ingram and Roberts, 2000; Hutt and Speh, 2012). In this regard, Hutt *et al.* (2000), amongst others (e.g., Ford *et al.*, 2003; Blomqvist and Levy, 2006), argue that neglecting the interpersonal relationships among the collaborative actors may result in weakening the business relationships, which in turn may lead to failure to meet the expectations of the relationship. Furthermore, grounded in the RV of competitive advantage perspective, Dyer and Singh (1998) stress the role of developing balanced relationships; i.e., inter-organisational and interpersonal ones, such as contractual ties and corporate activities among representatives of the cooperating actors, as a source for competitive advantage. In addition, the synergies generated from the balanced relationships result in several benefits for the collaborative actors, such as learning and knowledge sharing; i.e., relational rent (Dyer and Singh, 1998; Dyer and Hatch, 2006).

The final stage is **the relationship termination stage**. This comprises all the activities implemented by the actors in order to terminate undesired business relationships (Mitrega *et al.*, 2012, p. 742). When ‘value’ is defined as a trade-off between benefits and sacrifices, not all business relationships, e.g., with customer companies (industrial customers) and suppliers, are valuable (Ritter and Geersbro, 2011); consequently, any invaluable business relationships contribute negatively to value creation. Furthermore, Gulati (1998), among others (e.g., Hennart, Roehl and Zietlow, 1999; Wathne and Heide, 2000; Walter, Auer and Ritter, 2006), argues that opportunistic behaviour/opportunism might develop in inter-organisational relationships, such as taking advantage of the openness among actors and unfairly appropriating resources in order to outlearn each other. In effect, business relationship termination is in line with the DCV perspective that sees the sources of competitive advantage as temporary (Teece, Pisano and Shuen, 1997; Helfat *et al.*, 2007). Hence, business relationship termination is compatible with the DCV emphasis on the necessity for systematic reconfiguration of actors’ strategic focus into maintaining competitive advantage.

Reinartz, Krafft and Hoyer (2004) and Mitrega *et al.* (2012) argue that relationship termination is crucial for actors’ profitability, and further contend that actors should have the ability (i.e., firm-level routines) to correctly identify and terminate undesired business relationships. In essence, networking capability provides actors with the necessary firm-level routines to avoid terminating valuable business relationships, and as such increases the overall value of the relationship portfolio. Besides the benefits derived from networking capability in managing the relationship portfolio, as discussed in this section, networking capability has other consequences that foster actor’s ability to engage in the value co-creation process, as well as on firm performance in general. The following sub-section discusses these consequences.

2.5.2.2 Consequences of networking capability

The recent focus on value creation derived from inter-organisational relationships in business networks, the scholarly and managerial interest in networking capability, and the benefits derived from such capabilities, have received increased interest (Mitrega *et al.*, 2017). Walter, Ritter and Gemüden (2001) and Ryssel, Ritter and Gemüden (2004) acknowledge the economic consequences of networking capability, such as profit and sales volume, as well as its future consequences, such as increasing the value of relationship portfolios and synergistic collaborations that result in innovativeness.

Mitrega *et al.* (2017) argue that networking capability increases the value of the relationship portfolio by increasing several mutual benefits (e.g., knowledge sharing and resource integration) and reducing sacrifices, i.e., relationship-related costs. In this regard, Grönroos (1997) categorises relationship-related costs into three categories, namely psychological, direct and indirect. Psychological costs pertain to the burdens associated with anticipated future problems in business relationships, such as opportunistic behaviour and dysfunctional conflict (Madhok and Tallman, 1998; Wathne and Heide, 2000). Direct costs relate to the time, money and effort invested in initiating and developing inter-organisational relationships. Finally, indirect costs refer to all the resources deployed to solve situations when inter-organisational relationships do not function as promised (e.g., delays in information or raw material delivery) (Mitrega *et al.*, 2012).

Furthermore, networking capability encompasses internal communications, coordination activities among the collaborative actors, and relational skills, which all positively affect mutually supportive interactions (Walter, Auer and Ritter, 2006). In effect, networking capability contributes to actors' ability to access numerous resources, and to gain communication ability and conflict management skills; it also reduces transaction costs, and enhances actors' position in the business network (Gemünden, Ritter and Walter, 1997; Anand and Khanna, 2000; Walter, Auer and Ritter, 2006). Moreover, networking capability allows new ventures, start-ups and new entrants to the business network to build and maintain close relationships with high-status actors, which in turn provides them with attributes of reliability and quality (Stuart, Huang and Hybels, 1999). Therefore, actors' existence and growth depend on the development of networking capability, in order to establish and maintain purposeful interactions with the various sets of actors in the business network (Walter, Auer and Ritter, 2006). In essence, managing the relationship portfolio through developing network capability positions actors in a specific location in the business network; i.e., their network position (Håkansson and Snehota, 1995; McGrath and O'Toole, 2013; McGrath, Medlin and O'Toole, 2019).

After discussing the antecedents of the value co-creation process, the relationship stages, and the consequences of networking capability, it is clear that actors' ability to manage their relationship portfolio in business networks is critical for discovering opportunities, risk-taking, resource mobilisation and integration, and ultimately for overall performance. Furthermore, the relationship portfolio represents the actor`s location/position in the business network, and which influences the extent to which they can access network resources (Ford and Håkansson, 2006; Edvardsson, Holmlund and Strandvik, 2008). Therefore, the various actors in the business network, whether they are well established, entrepreneurs, new ventures, start-ups, large-sized or small and medium size enterprises (SMEs), must build their networking capability to strategically manage their business relationships and properly integrate the business network resources to ensure successful emergence, development and growth (Mu and Di Benedetto, 2012; Mitrega *et al.*, 2017; McGrath, Medlin and O'Toole, 2019).

Further, the concept of networking capability relates to the DCV of the firm (Mitrega *et al.*, 2012; Monteiro, Soares and Rua, 2019), particularly to the capabilities which enable the actors to manage the different relationship portfolios and to integrate resources with the other actors in the business network. Therefore, following the perspective of the DCV of the firm, this research argues that the actors can cope with the dynamic nature of the business network environment, and accomplish the resource integration required for the value-co-creation process through networking capability.

The following section discusses network position as the third aspect of the technology-enabled value co-creation process, together with social network theory.

2.5.3 Network position and social network theory

The above discussions on networking capability and access, as components of the DART model, describe the technology-enabled value co-creation process concerning 'what' is needed to facilitate the value co-creation process in digital interfaces and 'how' networking capability is a critical antecedent of the process in a business network setting. However, access to network resources does not simply occur by having networking capability (Mu and Di Benedetto, 2012; Thornton, Henneberg and Naudé, 2015; Mu *et al.*, 2017). Instead, access to novel resources, and utilising networking capability efficiently, are contingent upon another factor, network position (Muller and Peres, 2019, Eggers *et al.*, 2020).

According to Borgatti and Halgin (2011), much of the theoretical analysis of networks has focused on actors' positions (e.g., centrality) and network structure (e.g., network size). As such, network theories go beyond examining the attributes of the actors to examining the relationships that constrain and provide opportunities for them (Wasserman and Faust, 1994). Specifically, an important aspect of the network concept is that the relationships between actors are not treated in isolation (Freeman, 1979). Rather, they form a 'flow or pipes model' through which operant resources can flow, providing a mechanism that enables the actors to affect/connect with others indirectly (Borgatti and Halgin, 2011).

Borgatti and Halgin (2011) also shed light on the issue of what counts as a 'tie', and what the appropriate SNA question is that the researcher should ask in order to obtain the network. In this regard, following Laumann, Marsden and Prensky`s (1983) view of the social network known as the 'nominalist position', Borgatti and Halgin (2011) argue that every network question that asks actors to mention the names of the others they interact with determines the type of tie (e.g., innovation, knowledge) and generates its own network. As such, which question to ask participants is determined by the research question (Borgatti and Halgin, 2011). For instance, if the researcher asks *"Whom are you likely to turn to in order to discuss a new or innovative idea?"* (Parker and Cross, 2004, p. 147), the ties in question are innovation ones, and the network generated is an innovation network. Therefore, each question will form a network between the nodes that has its own structure and its own Implications for the nodes involved (Borgatti and Halgin, 2011, p. 1170). It should be noted here that the innovation network focuses mainly on exchanging information and resources pertaining to the development of new value propositions, consequently improving the effectiveness of innovation performance (Corsaro *et al.*, 2012; Kodama, 2015).

According to Borgatti and Halgin (2011), research on business networks and SNA encompasses two domains, namely the theory of networks and social network theory, based on whether the theory is examining the antecedents or the consequences (outcomes) of network variables. The theory of networks concerns the evolution of the network; i.e., the antecedents of network properties, meaning it refers to how the network was formed and why it has its current structure (Parkhe, Wasserman and Ralston, 2006; Borgatti and Halgin, 2011). In contrast, Borgatti and Halgin (2011) argue that social network theory examines the consequences of the network variables such as network position and how the network variables interact with other factors to yield certain outcomes for the actors.

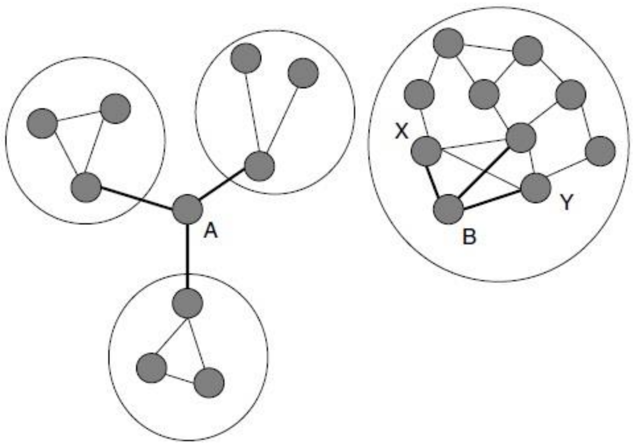
Network research has been criticised by many scholars, such as Salancik (1995) and Knoke (2001), who argue that such research and SNA lack theory and that network researchers are wavering between metaphor and methodology. Therefore, numerous scholars, such as Parkhe, Wasserman and Ralston (2006) and Moliterno and Mahony (2011), have addressed these critics in order to make sense of social network theory by providing a synthesis of its theoretical foundations. In this regard, we provide an overview of two well-known theoretical foundations that are central to social network theory in social sciences and which are closely related to each other (Borgatti and Halgin, 2011), namely SWT theory (Granovetter, 1973) and structural holes theory (Burt, 1992).

SWT theory is built on the assumption that the actors in networks are homophilous; i.e., they tend to build strong relationships with others who are similar to them (Borgatti and Halgin, 2011). As such, SWT is mainly based on the following two premises. The first premise posits that when the relationship between two actors is strong, their social world will overlap (Granovetter, 1973). For instance, if actor A has a strong tie with actor B, and actor B has a strong tie with actor C, the assumption is that there is a chance that actor A and actor C have at least a weak tie (Borgatti and Halgin, 2011). The second premise posits that linking actors who are not already connected to another actor by existing strong ties is a potential source of novel ideas (Granovetter, 1973). These new links are weak ties called ‘bridging ties’ (Borgatti and Halgin, 2011). By combining the two premises, Granovetter (1973) argues that strong ties (direct relationships) between actors are unlikely to be the source of novel ideas and information; instead, it is the weak ties (i.e., the bridging ties) that are the potential sources.

Structural holes theory is linked to social capital theory (Coleman, 1988; Nahapiet and Ghoshal, 1998) and is concerned with ego networks; i.e., an actor (ego) and the surrounding actors with whom the ego is directly connected (also referred to as alters) as well as all the ties between them (Burt, 1992). Coleman (1988) and Nahapiet and Ghoshal (1998) posit that social capital theory asserts the importance of interpersonal relationships in accessing network resources and influencing the extent to which resources are mobilised and shared within the network. Accessing, mobilising and sharing resources improve the network actors` outcomes by interacting with and integrating these resources with each other (Borgatti and Halgin, 2011).

It should be noted that structural holes theory does not take into account the ego’s own attributes, nor those of its contacts, such as how creative they are (Burt, 1992). Considering Burt’s discussion on structural holes, Borgatti and Halgin (2011) argue that although two actors might have the same number and strength of ties, as illustrated in Figure 2.1, the existence of more structural holes in actor A’s ego network than in that of actor B will result in more novel ideas and information (Burt, 1992). As a result, actor A may perform better than actor B in a given setting, such as innovativeness.

Figure 2.1: Structural holes.



Source: Adopted from Borgatti and Halgin (2011, p. 1171).

Burt (1992) argues that the reason behind the difference in performance between actor A and actor B, as shown in Figure 2.1, is that actor B is more likely to obtain the same information from different actors (e.g., actor X and actor Y in Figure 2.1), as they share the same contact pool. In contrast, actor A is connected to three different pools, therefore the information actor A obtains from these pools is more likely to be non-redundant, providing actor A with the ability to access novel ideas and information and increasing performance.

The discussion of SWT and structural holes theories has revealed two explanatory concepts of social network theory (Borgatti and Halgin, 2011). First, network function refers to the pipes/flow model, in which the network plays an essential role in resource flow (e.g., knowledge and information) among the actors in order to generate outcomes for the actors and/or for the whole network, such as creativity (Borgatti and Everett, 1992). The network function feature assumes that the longer the path between the actors, the longer the resource flows take to travel along that path (Knoke and Kulinkski, 1982; Ichinose *et al.*, 2018). Consequently, an actor in a central position, compared to the other actors in the network, receives the resource flow sooner than other actors (Wasserman and Faust, 1994; Muller and Peres, 2019). As a result, the resource flow outcomes received (e.g., the amount of non-redundant flow) by actors are related to more general outcomes such as performance and creativity (Burt, 1992; Daly, 2010).

The second concept is the network position. This indicates the centrality of the actor among the other actors in the business network (Tichy, Tushman and Fombrun, 1979). Network-based research underscores the importance of network centrality in providing the actors with the ability to access resources embedded in the business network, especially in collaboration and innovation networks (e.g., Tsai, 2001; Bell, 2005; Arranz, Arroyabe and Fernandez, 2020). According to Burt (1992), it is the network position that determines an actor`s ability to access non-redundant resources and new ideas for innovation, rather than the mere number of relationships in the relationship portfolio. Put differently, based on SWT theory (Granovetter, 1973) and structural holes theory (Burt, 1992), Burt (1992) argues that an actor with a central position will enjoy access to more new resources compared to an actor with a peripheral position, even if the peripheral actor has higher number of relationships. In accordance with Burt (1992), scholars such as Zaheer and Bell (2005), Abrahamsen, Henneberg and Naudé (2012), Muller and Peres (2019), Xu, Yan and Xiong (2019) and Eggers *et al.* (2020) argue that network position affects actors' potential to access resources, build relationships and influence other actors. Consequently, higher centrality indicates the importance of the network position and the ability to control information and knowledge flows, as well as coordination of the resource integration.

To this end, an actor`s decision to become involved in the value co-creation process is not formed in isolation from the business network, especially in technology-enabled ones (Ramaswamy and Ozcan, 2018a; Blaschke *et al.*, 2019; Marion and Fixson, 2021). We argued previously in section 2.3.3.2 that digital engagement platforms are essential for actors in terms of facilitating the process of selecting which others to collaborate with, and the capabilities and competences of those actors. We also argued that digital engagement platforms enable resource collaborations among the actors, while still ensuring their understanding of which resources they expect to integrate and which they will gain. In essence, when deciding to actively participate in the technology-enabled value co-creation process, actors must take into account the social context (i.e., business network) in which they interact with other actors (Ng and Vargo, 2018; Ramaswamy and Ozcan, 2018a). Through collaborations with others in the business network, actors can establish and develop interpersonal and inter-organisational relationships that contain new resources and information flows (Ingram and Roberts, 2000; Hutt and Speh, 2012; Mu *et al.*, 2017; Nardelli and Broumels, 2018; Arellano, Rebolledo and Tao, 2019). Therefore, network position is a critical factor in determining the level of accessed resources embedded in the business network through the relationship portfolio (Tsai, 2001; Bell, 2005; Muller and Peres, 2019; Xu, Yan and Xiong, 2019).

It is worth discussing here that upon reviewing the literature on business networks, we note that the concept 'network embeddedness' is used interchangeably with 'network position', although they are related, each concept has its unique use when analysing the social network and highlighting the underlying theory of the research propositions. Hence, it is necessary to clarify the two concepts; i.e., network embeddedness and network position.

2.5.3.1 Network embeddedness and network position

Building on the social capital theory (Granovetter, 1992; Nahapiet and Ghoshal, 1998), Uzzi (1997) defines network embeddedness as the extent to which an actor`s inter-organisational relationship is embedded in a network of mutual actors. In other words, network embeddedness describes the structure of actor`s relationships with other actors, and how those other actors are interconnected to each other. However, Granovetter (1992) argues that network embeddedness consists of two dimensions; relational and structural. According to Granovetter (1992) and Rowley, Behrens and Krackhardt (2000), relational embeddedness refers to the quality and depth of relationships. Nahapiet and Ghoshal (1998) argue that relational embeddedness is developed through a history of interactions on the personal level between the actors, hence, it is mainly concerned with interpersonal relationships. Although Gulati and Gargiulo (1999) agree with Nahapiet and Ghoshal (1998) that the focus of relational embeddedness is interpersonal level, they argue that relational embeddedness is formed during the relationship initiation stage (see section 2.5.2.1) among the actors who they already had previous collaborations with, or with new actors whom have been selected based on recommendations from other actors. Xie, Wang and Jiao (2019) add to this debate by arguing that relational embeddedness is also an indicator of social interaction`s cohesiveness; it is formed by recurrent interactions that results in maintaining sustainable and trustworthy relationships. In that, the actors utilise the interpersonal relationships to construct a common understanding of mutual goals and benefits of the relationship i.e., *"overlapping identities and feelings of closeness or interpersonal solidarity"* (Arranz, Arroyabe and Fernandez, 2020, p. 3). Gulati (1998) refers to the application of relational embeddedness in studying business networks as the 'cohesion perspective on networks'. In that, the emphasise in relational embeddedness is on direct and cohesive relationships rather than indirect and non-redundant ones.

Unlike the relational embeddedness, the structural embeddedness goes beyond personal and direct relationships into linking the actors with inter-organisational relationships (Nahapiet and Ghoshal, 1998). Accordingly, structural embeddedness focuses on the configuration of the network, specifically the hierarchy of the actors in the network, the degree to which the actors are connected (i.e., connectivity) and actors' centrality. Gulati (1998) therefore, refers to the structural embeddedness as 'positional perspectives on networks'. In essence, Xie, Wang and Jiao (2019) and Arranz, Arroyabe and Fernandez (2020) argue that structural embeddedness describes the dominant structural location in the network, providing the actor in such location with (i) network resources; (ii) reputation benefits; (iii) the ability to establish cooperative relationships; and (iv) a platform for social interactions, as such fostering inter-organisational learning and improving the actor's capacity to exploit innovations.

The extent to which an actor can access network resources depends on the number and structure of relationships they have in the business network (Borgatti and Everett, 1992; Burt, 1992; Gulati and Gargiulo, 1999). Granovetter (1973, 1992) argue that an actor can belong to a dense network; the majority of the actors are tightly connected with each other, or to a sparse network, meaning that several actors in the network are not highly connected, and are at peripheral positions. Echols and Tsai (2005) refer to the former as 'redundant networks` while the later as 'non-redundant networks'.

In essence, the notion of relational embeddedness is in line with the 'strong ties' (Granovetter, 1973) premise of SWT theory, that cohesive and recurrent relationships in redundant networks confer a kind of trust and commitment to the relationship. In effect, due to the 'strength' of the relationship, actors are more likely to grant access to tacit knowledge, technology and other resources such as financial, required for innovation. Despite the advantages of relational embeddedness, Granovetter (1973, 1992) and (Burt, 1992) argue that overreliance on strong ties case the actors to remains 'locked-in' in a circle within the wider business network, as such, actors are unlikely to access novel ideas as those in non-redundant network.

It can be seen from the above discussion that, based on SWT theory, structural holes theory and social capital theory, network scholars have conflicted opinions about which network configuration (redundant network/non-redundant network) provides the actors with rich resources required for innovation. However, what network scholars agree on is that each actor should evaluate their network position, and manage the relationships portfolio in a way that ensure a kind of ambidexterity between redundant and non-redundant relationships (e.g., Burt, 1992; Echols and Tsai, 2005; Xie, Wang and Jiao, 2019; Arranz, Arroyabe and Fernandez, 2020). From the SWT perspective the structural role of weak ties in bridging the network clusters (i.e., "*areas in the business network where actors are more closely linked to each other compared to the rest of the actors in the network*" (Tichy, Tushman and Fombrun, 1979, p. 509)), as well as the structural holes, both shape actors' network position and makes it more central in the business network, as such, playing a fundamental role in providing them with access to novel ideas and information (Granovetter, 1973; Burt, 1992; Borgatti, Brass and Halgin, 2014).

Within the literature on networks and the impact of network characteristics on actors` performance, disagreement about the effect of closeness centrality (i.e., having a central position in the network) on the flows of resources and discovery of innovation opportunities within the network was noted. On one hand, several studies (e.g., Ibarra, 1993; Prajogo and Sohal, 2003; Soh, 2010; Klein, Ahlf and Sharma, 2015; Mani and Luo, 2015; Salazar *et al.*, 2016; Muller and Peres, 2019; and Piazza *et al.*, 2019) based on the resources-dependence perspective, social network theory, and the RV of competitive advantage, argue that higher closeness centrality grants actors with higher levels of access to network resources, based on the fact that those with higher levels of closeness centrality can access the other actors in the business network with short average path lengths. According to Watts and Strogatz (1998) and Borgatti, Brass and Halgin (2014), average path length denotes the shortest distance between two actors, as discussed in detail in section 4.6.5. This line of study underscores the benefit of having a central position in the business network and asserts the critical role of actors with high centrality (often called brokers or gatekeepers) in transmitting or inhibiting such flows. In accordance with these schools of thought, Jaakkola and Hakanen (2013), in their investigation of 'value co-creation in solution networks', argue that actors with more central positions (referred to as 'integrators' in their research) are the coordinators of resource integration, while other actors with less central positions (e.g., suppliers) have less impact on resource integration and only act as providers for the integrators.

On the other hand, the other stream of research (e.g., Burt, 1992; Dhanaraj and Parkhe, 2006) argues that actors in central positions might affect the flows of resources and their ability to bridge the structural holes to access resources. Actors with less central positions, i.e., those who are more peripheral, are less influenced by the more central and dominant actors in the business network, which implies that they enjoy more freedom in interacting and connecting with other actors with potentially more advanced technologies, resources and novel ideas (Gilsing *et al.*, 2008). In fact, Granovetter, 1973 (p. 1371) posits that *"those to whom we are weakly tied are more likely to move in circles different from our own and will thus have access to information different from that which we receive".* Furthermore, Dhanaraj and Parkhe (2006) argue that it is not the central position per se that grants access to resources and exposure to innovation opportunities, but instead it is how the actors exploit their position and 'act' to turn that position into an advantage.

Since this research focuses on firm innovativeness as a value-based outcome of the technology-enabled value co-creation process in the context of business networks, it is useful to clarify the reasoning behind this choice by discussing the drivers and antecedents of firm innovativeness in the following section. By doing so, the section highlights the research gaps in the marketing and strategic management literature and offers further research contributions.

2.6 Firm innovativeness, its drivers, antecedents and performance outcomes

Innovativeness is a key indispensable ingredient in the success of organisations, their long-term survival and prosperity, as well as their sustainable competitive advantage in the intensively competitive market environment (Hult, Hurley and Knight, 2004; Salleh *et al.*, 2018). In short, Tajeddini, Trueman and Larsen (2006) define innovativeness as the introduction of 'newness', such as products, process or ideas that play a crucial role in generating value for firms in the marketplace and stock market. Mu *et al.* (2017) acknowledge that innovativeness also "*refers to supporting new ideas and breaking from established practices or technologies"* (p. 189). Similarly, in the marketing field, innovativeness has become a critical subject that is receiving attention from many scholars (see the meta-analysis and systematic literature reviews by Kirca, Jayachandran and Bearden, 2005, Rubera and Kirca, 2012 and You *et al.*, 2020), as it is a valuable tool for marketing executives to persuade the board of members to strategically invest in 'newness', not only to increase revenue, but also to reduce the cost of operations (Rubera and Kirca, 2012). Studies have investigated the drivers/antecedents that lead to firm innovativeness (e.g., Hult, Hurley and Knight, 2004; Tajeddini, Trueman and Larsen, 2006; Rhee, Park and Lee, 2010), as well as its outcomes on firm performance and firm value (e.g., Rubera and Kirca, 2012).

The following sub-sections provide detailed knowledge of the drivers/antecedents, outcomes and moderating factors along the chain of relationship between varieties of orientations, firm innovativeness and business performance. Discussing these antecedents and drivers allows us to position the DART model into context, concerning its impact on firm innovativeness within the wider marketing and innovation theoretical discourses.

2.6.1 Drivers and antecedents of firm innovativeness

As discussed earlier in this chapter, the S-D logic perspective stresses the importance of harnessing actors` competences in order to enhance the organisation's competitive advantage, competences and innovation. We also noted that Vargo and Lusch (2017) call for the breaking out of dyadic relationships, since *"dyadic interactions do not take place in isolation, but rather within networks of actors, of which the dyad is just a part."* (Vargo and Lusch, 2017, p. 48). Put differently, the dyadic and micro-level focus of the S-D logic perspective was extended later into a broader context, encompassing a wider set of stakeholders, such as customer connections (e.g., peers and family), business partners (e.g., wholesalers and retailers), and other actors (e.g., competitors and independent inventors). Since this research is network-focused; it is critical for us here to clarify the drivers and antecedents of innovativeness at different analytical levels of business networks, i.e., the micro, meso and macro (Lavrakas, 2008), as seen by marketing and strategic management scholars.

Scholars such Hult, Hurley and Knight (2004) and Rhee, Park and Lee (2010) consider market orientation, entrepreneurial orientation and learning orientation as the drivers and antecedents of firm innovativeness for innovation-oriented organisations. Market orientation refers to either the organisational behaviours and activities or an aspect of organisational culture, which aim to deliver superior value propositions that satisfy buyers and help to generate superior business outcomes (Menguc and Auh, 2006; Tajeddini, Trueman and Larsen, 2006). Hult, Hurley and Knight (2004) and Monteiro, Soares and Rua (2019) define entrepreneurial orientation as a pro-active and risk-taking act involving practices and decision-making in the business process to exploit potentials and opportunities for replacing the static existing business for the sake of transformation and innovation, while learning orientation refers to the act of acquiring knowledge and new skills in the development of the organisation and its performance (Calantone, Cavusgil and Zhao, 2002).

Using a comprehensive and empirically verified model, Hult, Hurley and Knight (2004) show that market orientation, entrepreneurial orientation and learning orientation have a significant and positive effect on innovativeness and business performance. First, market orientation, which has become an important factor which impacts on innovativeness, with studies starting to examine this antecedent in-depth through a set of different factors. For instance, by exploring the relationship between the innovativeness and performance of SMEs, Tajeddini, Trueman and Larsen`s (2006) study specifies that market orientation, in terms of customer orientation, competition orientation and inter-functional coordination, has a positive effect on the level of innovativeness and business performance. Hunt and Morgan (1995) and Johnstone, Dainty and Wilkinson (2009) define customer orientation as the organisation's focus on its customers' needs by performing sets of actions to meet and/or exceed customer expectations in order to achieve customer satisfaction. On the other hand, competition orientation refers to assessing the organisation`s weaknesses , strengths, capabilities and strategies relative to their competitors (Narver and Slater, 1990). In this regard, Bendle and Vandenbosch (2014) argue that competitor orientation has a *"focus on beating the competition rather than maximizing profits"* (p. 781). Narver and Slater (1990) define inter-functional coordination as *"'the coordinated utilization of company resources in creating superior value for target customers"* (p. 22).

Second, learning orientation. The results from Hult, Hurley and Knight`s (2004) study reveal that this has a direct positive effect on firm innovativeness (Hult, Hurley and Knight, 2004). Rhee, Park and Lee (2010) argue otherwise , that Hult, Hurley and Knight (2004)'s study mostly focuses on large organisations such as those in the 'Fortune 500 companies', which is inappropriate for SMEs, as well as taking the three antecedents of market orientation, learning orientation and entrepreneurial orientation in the same dimension. Therefore, the study proposes learning orientation as a mediating factor between market orientation and entrepreneurial orientation – the innovativeness relationship.

Third, entrepreneurial orientation. Gibb and Haar (2010) argue that entrepreneurial orientation, specifically risk-taking decisions, can affect innovativeness, which in turn positively influences firm performance in the way that higher risk and innovativeness lead to higher firm performance, regardless of the level of competitive rivalry. In addition, Gibb and Haar (2010), together with Rhee, Park and Lee (2010), argue that entrepreneurial orientation fosters organisations` development and innovativeness, irrespective of the varying levels of market instability, since it assists in erasing old-fashioned strategic structures and traditional leadership, bringing advanced corporate restructuring and leadership performance. However, Rhee, Park and Lee's (2010) study diverges with that of Hult, Hurley and Knight (2004) by arguing that market and entrepreneurial orientation positively influence innovativeness through the moderating effect of learning orientation.

Network measures (e.g., centrality measures) have also received attention from scholars as both antecedents and moderators when studying firm innovativeness. For instance, Rodrigo-Alarcón *et al.* (2017) identify technological dynamism and market dynamism as drivers of firm innovativeness, with network density as a moderator of these relationships. Wasserman and Faust (1994) add to Freeman`s definition of network density by also describing the connections of members and contacts in supporting and cooperating on expertise, resources and trust in a win-win situation. Based on the DCV of the firm, market dynamism, such as market conditions, impels organisations to devise appropriate strategies to cope with conflicting threats and opportunities (Eisenhardt and Martin, 2000; Teece, 2007). Technological dynamism, on the other hand, refers to the ability of organisations to make technological changes to deliver superior value propositions (Rodrigo-Alarcón *et al.*, 2017; García-Villaverde *et al.*, 2018). Employing social network theory, Rodrigo-Alarcón *et al.*'s (2017) study finds that technological dynamism has a positive effect on firm innovativeness, with a negative interaction between network density and technological dynamism. In contrast, there is no impact between market dynamism and innovativeness, with a positive moderating effect between market dynamism and network density. The findings indicate that organisations, in particular managers, should make timely changes to confront the extent of dynamism in the environment and technology by utilising network density.

The importance of network structure, specifically the internal and external communications between actors, are also evident and supported by Salleh *et al.*'s (2018) and Rodan and Galunic's (2004) studies. In more detail, while Salleh *et al.*, (2018) argue that the significance of network structure lies in the ability of actors to evaluate their decisions and strategies by analysing and evaluating the other actors in the business network. Rodan and Galunic's (2004) study reveals that access to knowledge heterogeneity and network sparseness generate greater managerial innovative performance. These findings are in line with the SWT and structural holes theories, as discussed in section 2.5.3. Specifically, Rodan and Galunic (2004) argue that engagement and collaboration activities among actors generate accessible cooperated resources, knowledge and competences, thus fostering firm innovativeness in a technologically fierce environment (Ozdemir *et al.*, 2020). These findings are also in line with the S-D logic perspective, in which connectivity, interactivity and synergistic collaborations with the great variety of actors are at the heart of value co-creation. In this regard, Di Tollo *et al.* (2012) posit that value co-creation is another antecedent and a strong indicator of firm innovativeness.

To this end, the findings of the aforementioned studies, among others, are in line with the S-D logic perspective of the necessity to incorporate the various actors in the business network in the value co-creation process, aiming for enhancing firm innovativeness and the gaining of superior competitive advantage. It can be seen in this sub-section that the common theme in innovativeness research is the emphasis on collaborations and resource integration, which are fundamental for value co-creation (Prahalad and Ramaswamy, 2004; Vargo and Lusch, 2017; Ramaswamy and Ozcan, 2018b). It is also evident from the research on innovativeness that the DART model components, even though they have not been studied collectively in one framework, as is the case in this research, it is emphasised in the literature that they have an impact on firm innovativeness. Specifically, the components of the DART model are featured in innovativeness studies in the following ways: **dialogue,** i.e., interactive communication (e.g., Deshpandé and Farley, 2004; Van Raaij and Stoelhorst, 2008; Song, Wei and Wang, 2015; Muller and Peres, 2019); **access** and utilising network resources (e.g., Sandvik and Sandvik, 2003; Wang *et al.*, 2008; Stanko, Bohlmann and Molina-Castillo, 2013; Monteiro, Soares and Rua, 2019); **risk/benefit assessment** (e.g., Srinivasan, Lilien and Rangaswamy, 2002; Rubera and Kirca, 2012; Homburg, Wilczek and Hahn, 2014); and **transparency** (e.g., Inemek and Matthyssens, 2013; Mu *et al.*, 2017).

The following section discusses the outcomes of firm innovativeness, indicating at the same time the reason for choosing this construct as a value-based outcome of the technology-enabled value co-creation process in the current research.

2.6.2 Firm innovativeness outcomes

Although the relationship between firm innovativeness and several outcomes concerning business performance (see Hult, Hurley and Knight (2004) and Rhee, Park and Lee (2010)), such as new product performance (e.g., Ozdemir *et al.*, 2020), NPD performance (e.g., Han, Kim and Srivastava, 1998) and the quality of products or services (e.g., Cho and Pucik, 2005) has been established, scholars such as Rubera and Kirca (2012) argue that deeper knowledge of firm innovativeness and firm performance across a range of academic fields such as marketing, strategic management and international business lacks theoretical and empirical integration. Moreover, Acur, Kandemir and Boer (2012) note that *“existing research does not provide an explanation of why innovativeness should enhance NPD performance”* (p. 307). This sub-section describes the relationship of between firm innovativeness with regard to (i) strategic alignment, and (ii) firm outcomes.

Concerning strategic alignment, the results from Acur, Kandemir and Boer`s (2012) study reveal that innovativeness has a significant positive effect on strategic alignment, in terms of (i) technological; (ii) market; and (iii) NPD marketing alignments. They define technological alignment as organisations’ ability to actively detect and identify technological developments in the market, with the aim to utilise and integrate such developments into their new products. Gatignon and Xuereb (1997) define NPD marketing alignment as the extent to which the NPD and marketing functions collaborate in terms of exchanging operate resources such as information, to reach a position of agreement through communication and interactions, and subsequently fostering the potential of strategic alignment (Acur, Kandemir and Boer, 2012). Market alignment, however, refers to the organisation`s *“ability to identify and analyze the current and future needs of its target markets and to integrate market information into its NPD activities to continuously create greater customer value”* (Acur, Kandemir and Boer, 2012, p. 305). Specifically, the results of their study show that stronger firm innovativeness leads to stronger technological, market and NPD marketing alignments. This is due to the fact that innovativeness (i) entails cooperation among the different parties in the organisation, such as NPD and marketing departments; (ii) advocates risk-taking behaviour; and (iii) is based on proactive scanning of the internal and external environments for technological as well as market opportunities.

Concerning the financial outcomes of firm innovativeness, Rubera and Kirca (2012) and Boso *et al.* (2013) argue that it enhances firm export performance and firm values such as stock market performance, return on equity and sales growth. According to Boso *et al.* (2013), in the international marketing context, firm innovativeness is vital for the success of firm exporting activities, especially those operating in aggressive and competitive environments. The findings of Boso *et al.`s* (2013) study shows that the relationship between firm innovativeness and export performance is stronger subject to the export market environment and internal organisation conditions; i.e., organisational structure. In particular, the findings reveal that robust networking capabilities and higher structural organicity, i.e., *“decentralized and informal, with an emphasis on lateral interaction and an equal distribution of knowledge throughout the organizational hierarchy”* (p. 67), will boost innovativeness and export performance.

Rubera and Kirca (2012) argue that current theories tend to focus highly on the surface level of the relationship and the mechanism of firm innovativeness with its performance outcomes, neglecting a unifying framework that could incorporate the fragmented literature and investigate the effect of innovativeness on firm performances. In particular, studies have favoured traditional relationship between innovativeness, market and financial positions and firm value respectively, ignoring the complex network of inter-relationships between the variables. Therefore, Rubera and Kirca (2012) have employed quantitative meta-analysis techniques to provide insight into the chain-of-effects model, which goes beyond the mere relationship between firm innovativeness and its performance outcomes. The findings confirm that (i) firm innovativeness directly and positively affects financial position and firm value; (ii) firm innovativeness has an indirect effect on firm value through market position and financial position; and (iii) there exists a reverse causality in the firm innovativeness – firm value relationship; firm innovativeness will have a positive effect on firm value, at the same time, firm value, as a result of successful marketing actions, can be an indication of the availability of resources that can be used to impact firm innovativeness (Hanssens, Rust and Srivastava, 2009).

The essence of Rubera and Kirca`s (2012) study also contributes to the research streams by investigating the moderating effects of contextual factors such as firm-, industry-, and country-level factors on the relationship between firm innovativeness and firm value, market position and financial position. Identifying the gaps related to the lack of contextual research design, the authors propose contextual factors such as advertising intensity, product diversification, firm age, intangible factors and competitive intensity to further extend the post-hoc explanations in existing studies. In particular, their findings show that firm innovativeness has a strong effect on larger firms in high-tech industries and on their market and financial positions when the emphasis of their investment is on advertising and radical innovations. Similar to the case of smaller firms in low-tech industries, inputs in radical innovation and innovativeness culture will strengthen the relationship between firm innovativeness and firm value.

2.7 Research gaps

This section presents a synthesis of the findings from the literature review in relation to the three aspects of value co-creation, namely the DART model, networking capability and network position. It also identifies the research gaps in the existing knowledge, together with detailed discussion of how this research fills these gaps and contributes to the current state of the art.

2.7.1 Research gaps in relation to the value co-creation process in business networks

As highlighted earlier in section 2.3, the value co-creation concept was originally popularised by Vargo and Lusch in 2004 when they introduced the S-D logic perspective as a new logic in marketing in order to address issues related to service innovation and development associated with G-D logic. G-D logic defines intangible goods (services) as a unit of output, and tangible goods as a vehicle to deliver the value-added service to customers (Cova and Salle, 2008; Vargo, Maglio and Akaka, 2008). The distinction between goods and services raises the idea of creating a science of services, also known as service science, to remedy the fact that service innovation is poorly understood (Maglio and Spohrer, 2008). Service science conceptualises service systems as a configuration of actors, including individuals and organisations, technology, and resources such as information, which drive value co-creation within individual organisations and across economies. However, Vargo, Maglio and Akaka

(2008, p. 151) argue that *“many service science and service research problems remain, particularly in the context of value co-creation through resource integration across service systems.”* Maglio *et al.* (2009), together with Hein *et al.* (2019) and Mele, Polese and Gummesson (2019), identify the challenge of determining the value co-creation process as one of the key problems in service science and the S-D logic perspective.

Furthermore, mainstream research tends to emphasise the DART model in B2C and B2B dyadic relationships (e.g., Mazur and Zaborek, 2014; Schiavone, Metallo and Agrifoglio, 2014; Albinsson, Perera and Sautter, 2016; Taghizadeh *et al.*, 2016; Solakis, Peña-Vinces and Lopéz-Bonilla, 2017; Taghizadeh, Rahman and Marimuthu, 2019; Villalba and Zhang, 2019), lacking the perspective of its essence in capturing more holistic and complex inter-organisational settings in the technology-enabled value co-creation process. What is more, according to our literature review, although the S-D logic perspective offers a set of FPs and axioms (Table 2.3) to conceptualise the value co-creation process, the discussion in the value co-creation literature remains largely theoretical and lacks adequate empirical evidence.

The research in this study addresses the lack of a framework that takes into account inter- and multi-organisational relationships to analyse value co-creation as a process, as noted by Füller (2010), Polese, Mele and Gummesson (2017) and Hein *et al.* (2019). While the DART model is considered in several studies to be the most appropriate one for value co-creation, since it takes into account the dyadic relationships in B2C and B2B relationships (e.g., Prahalad and Ramaswamy, 2004; Randall and Leavy, 2014; Taghizadeh, Rahman and Marimuthu, 2019), its extension beyond such relationships is still lacking. To the best of our knowledge, few studies have examined the DART model empirically using quantitative techniques, with those that have done so focusing on the organisation-customer dyad (e.g., Schiavone, Metallo and Agrifoglio, 2014; Solakis, Peña-Vinces and Lopéz-Bonilla, 2017; Villalba and Zhang, 2019). Other quantitative empirical studies have been conducted to develop and validate a measurement scale for the DART model (e.g., Mazur and Zaborek, 2014; Albinsson, Perera and Sautter, 2016; Taghizadeh *et al.*, 2016).

The current research on value co-creation (e.g., Ramaswamy and Ozcan, 2018a; Vargo, 2018; Winkler and Wulf, 2019; Hein *et al.*, 2019) supports the idea that a deeper approach may assist in understanding the essential role of the value co-creation process in digital engagement platforms. In particular, the recent developments in the S-D logic perspective (Vargo and Lusch, 2017; Ng and Vargo, 2018) and the value co-creation literature (e.g., Ramaswamy and Ozcan, 2018b; Mele, Polese and Gummesson, 2019) propose that due to the advances in ICT, value is no longer co-created in dyads; instead, value co-creation takes place within a business network formed by multiple actors. With the acceleration of digitally-enabled collaborations between actors, especially during the COVID-19 crisis (Baig *et al.*, 2020; Budhwar and Cumming, 2020; King, 2020), extending the DART model to accommodate the multi-stakeholders in the business network will help foster firm innovativeness and performance. Nevertheless, current research on value co-creation that employs the DART model as a process to facilitate value co-creation in digital interfaces remains confined to dyadic relationships.

Although several studies (e.g., Osei-Frimpong and Owusu-Frimpong, 2017; Vargo, Akaka and Vaughan, 2017; Ng and Vargo, 2018; Ramaswamy and Ozcan, 2018a; Davey and Grönroos, 2019; Hein *et al.*, 2019) emphasise the critical role of digital platforms in improving the resource integration that leads to enhanced service experience and ultimately the co-creation of value, the digital platform component of the value co-creation concept was neglected before COVID-19 (for recent meta-analysis see Amorim Lopes and Alves, 2020). In addition, how the technology-enabled value co-creation process takes place on the platform is underexplored (Lusch and Nambisan, 2015; Ramaswamy and Ozcan, 2018a; Hein *et al.*, 2019), leading to the underperformance and ineffectiveness of resource management in business networks. Bridging this gap will optimise organisations' abilities in effective and timely resource allocation and integration, leading to better time-saving and cost-effective practices for value co-creation.

As noted in Chapter 1 (Introduction), due to the COVID-19 crisis, the importance of digital engagement platforms has become clear and visible in many sectors such as education, IT, digital services and healthcare (Yen, 2009; Beech and Anseel, 2020; Keesara, Jonas and Schulman, 2020; Schiavone *et al.*, 2020; Shankar, 2020; Marion and Fixson, 2021), and therefore should not be neglected. Further, with the acceleration of digitally-enabled collaborations among actors (especially since the COVID-19 crisis started), which can foster firm innovativeness and performance, a deeper approach is needed to understand the essential role of the value co-creation process in digital engagement platforms in enabling the alleviation of actors' interactions and relationships in the process.

The lack of a comprehensive process could diminish the opportunities for organisations to take advantage of potential actors with the most valuable resources. Hence, we argue that what is missing from the current literature on the value co-creation process is an empirically tested holistic framework which integrates the DART model in order to examine the technology-enabled value co-creation process and the moderating role of network position between network capability and access, which is one factor in the DART model.

To this end, the main contribution of this research is the introduction of a conceptual framework as a suitable tool to conceptualise the value co-creation process in a business network context through: (i) the inclusion of networking capability as a critical antecedent and vital component of the value co-creation process; (ii) incorporating the moderating effect of network position on the networking capability-access to embedded resources relationship; and (iii) encompassing firm innovativeness as a value-based outcome of the process. In effect, the S-D logic perspective is expanded by testing the impact of the digitalised value co-creation process on enhancing firm innovativeness in business networks. Consequently, the research contributes to service science by bridging the gap emphasised by Maglio *et al.* (2009), Hein *et al.* (2019) and Mele, Polese and Gummesson (2019), as mentioned earlier in this chapter, that determining the value co-creation process in general, and in business networks in particular, is one of the key issues from both the service science and S-D logic perspectives. As a result, the investigation of a holistic conceptual framework in capturing technology-enabled value co-creation beyond dyadic relationships into more complex inter-organisational settings assists in answering the overarching research question:

In a business network context, to what extent does networking capability affect the digitalised value co-creation process that results in innovativeness and how does the actors` network position influence this process?

2.7.2 Research gaps in relation to networking capability in the value co-creation context

It can be seen from the discussion in section 2.5.2 that the majority of the related research focuses on the effect and structures of the value co-creation process, for example Prahalad and Ramaswamy (2004), Payne, Storbacka and Frow (2008) and Yi and Gong (2013); the motives to engage in the process (Frow *et al.*, 2015); the outcomes of the process, (e.g., Reypens, Lievens and Blazevic, 2016); and the roles played by the actors in the process (e.g., Breidbach and Maglio, 2016). However, these researches have neglected the capabilities the actors need to possess to effectively engage in the process, such as networking capability, which is crucial in boosting firm innovativeness, firm performance and competency in a progressively competitive business environment. We note two research gaps related to networking capability, as discussed below.

First, we underscored earlier that recently the underlying idea of the S-D logic perspective has been that the value co-creation process has been digitally transformed from a linear one between organisations and final customers/clients, to the inclusion of a variety of actors in a more complex system. In effect, Polese, Mele and Gummesson (2017, p. 926) argue that *"the development of new frameworks is therefore required to analyse value creation as a process resulting from the many to many relationships between all the actors involved (stakeholder centricity) rather than as the dyadic relationships between a supplier and customer".* However, whilst previous studies (e.g., Payne, Storbacka and Frow, 2008; Grönroos and Voima, 2013;

Yu *et al.*, 2020) have offered theoretical frameworks for value co-creation, they have only been focused on dyadic relationships. To the best of our knowledge, no framework includes networking capability, which would make the value co-creation process suitable for application in business networks.

Second, current research on business networks remains largely focused on the outcomes of the relationships and collaborations in business networks, together with their structure (e.g., Mu and Di Benedetto, 2012; Mitrega *et al.*, 2017; Xu, Yan and Xiong, 2019). As a result, the exploration of the capability that actors need to manage their relationships, and thereby enhance their ability to deploy and leverage network resources, is lacking in the literature (Mu and Di Benedetto, 2012; Majid *et al.*, 2019). In particular, the impact of actors' capabilities (networking capability in this research) on the value co-creation process remains largely underexplored (Zhang *et al.*, 2015). These research gaps prompted the following research question:

RQ1. How can networking capability be a catalyst for innovativeness through a technology-enabled value co-creation process in a multi-stakeholder business network?

This research approaches the first research question concerning networking capability by acknowledging its importance as a catalyst for innovativeness in a technology-enabled value co-creation process in a multi-stakeholder business network setting (Zhang *et al.*, 2015; Nardelli and Broumels, 2018). The research employs the DCV of the firm as a theoretical lens to determine the antecedents of the value co-creation process, acknowledging the role played by the multi-stakeholder business network in the process. As discussed earlier, although studies have proven the importance of looking more closely at the antecedents of the value co-creation process in multi-stakeholder business networks (Zhang *et al.*, 2015; Murthy *et al.*, 2016), those in the fields of marketing and strategic management have to date focused on the outcomes of the process, such as enhancing competitive advantage, firm performance, new product development (NPD) and new service development (NSD) (Mu and Di Benedetto, 2012; Mitrega *et al.*, 2017; Majid *et al.*, 2019; Xu, Yan and Xiong, 2019). This research takes a step further, by examining the literature on value co-creation, especially B2B and network-focused research, to establish what capabilities actors should have to successfully engage in the value co-creation process through digital interfaces.

The COVID-19 crisis has accelerated the urgent need for virtual connectivity/collaboration across all sectors in general (Baig *et al.*, 2020; Nielsen, 2020; Shankar, 2020) and in particular the growing importance of business networks (Dataquest, 2020; Marion and Fixson, 2021). In acknowledging and adapting to the uncertainties created by the COVID-19 pandemic, scholars must account for the role networking capability plays in the digitalised value co-creation process, by developing a deeper appreciation of networking capability and its critical role in value co-creation. This research does this, and thus provides an enhanced discussion of the value co-creation process antecedents, which has been largely limited in the newly emerging value co-creation topic in the field of marketing research and innovativeness. More specifically, the antecedents include networking capability, which influences actors' engagement in the value co-creation process, together with the outcomes (firm innovativeness). The research therefore extends the S-D logic perspective and the DCV of the firm to the technology-enabled value co-creation concept, and consequently the business network context. In particular, it contributes to the development of the S-D logic perspective by (i) drawing attention to the neglected facet of the DCV of the firm, i.e., networking capability; and (ii) providing an in-depth analysis of the impact of networking capability on each component of the DART model, a model which conceptualises the technology-enabled value co-creation process; and (iii) examining the impact of the DART model on firm innovativeness, and consequently, answering the second research question:

RQ2. To what extent does the DART model affect firm innovativeness?

2.7.3 Research gaps in relation to network position in the value co-creation context

Borgatti and Halgin (2011) posit that *"if occupying a certain position in the network is rewarding, we can expect actors to take steps to achieve that position"* (p.1178). However, current network-based research (e.g., Gilsing *et al.*, 2008; Hsueh, Lin and Li, 2010; Arranz, Arroyabe and Fernandez, 2020) is largely focused on (i) how network position impacts on resource integration outcomes and firm performance; and (ii) how access to resources is enabled or constrained as a result of the network position, rather than investigating how network position influences resource integration and the value co-creation process in a business network setting, or exploring the capabilities actors need to manage their relationship portfolio and leverage the network to their benefit. In essence, social network theory represents an important complementary perspective to consider alongside the S-D logic perspective (Gummesson, 2008; Laud *et al.*, 2015) and DCV of the firm (Möller *et al.*, 2002; Mu, 2013) in order to understand how actors can manage their relationships portfolio and integrate network resources to achieve the desired outcomes, such as enhancing firm innovativeness.

Moreover, although the effect of actors' embeddedness in business networks on resource integration outcomes and firm performance, such as economic and innovation performance, has received increased attention from scholars (e.g., Gilsing *et al.*, 2008; Hsueh, Lin and Li, 2010; Arranz, Arroyabe and Fernandez, 2020), *"the concept of an actor's embeddedness is* *rarely discussed in association with service-dominant (S-D) logic"* (Laud *et al.*, 2015, p. 509). Subsequently, understanding the factors affecting resource integration and the value co-creation process among actors in the business network is lacking in the literature (Edvardsson, Skålén and Tronvoll, 2012; Laud *et al.*, 2015). In fact, Mele, Sebastiani and Corsaro (2019) indicate that the influence of network structures on actors' ability to access and integrate available resources and capabilities embedded in business networks has not been sufficiently analysed. Therefore, this research takes into account the moderating effect of network position on actors' ability to apply their capabilities to build inter-organisational relationships, through which they have access to relevant resources and information in business networks.

Further, we noted in Chapter 1 (Introduction) that the approach of using network structure variables as moderators is not new for marketing and strategic management scholars in network-focused research. For instance, closeness centrality and network density (i.e., the number of relationships the actor has compared to the total number of relationships in the business network (Freeman, 1979) were employed by Mani and Luo (2015) as moderators in product alliance activity-stock return and product alliance activity-systematic risk relationships. Similarly, in Thornton, Henneberg and Naudé's (2015) research, closeness to end-users was hypothesised to have a moderating effect on the relationship between network-oriented behaviour and relationship portfolio effectiveness. Moreover, network density was employed as a moderator in research on buyer-supplier relationships in R&D projects by Mahmood, Zhu and Zajac (2011), and on marketing alliances and firm risk by Thomaz and Swaminathan (2015). However, the complementary combination of SNA with SEM, and the further elaboration on SNA data to explain the results of moderation analysis, provide more clarity and more comprehensive interpretations of the influence of centrality measures. The focus of our third aim (i.e., to improve understanding of how an actor`s network position influences the networking capability-access relationship) allows us to go beyond merely treating centrality measures as constructs in a statistical model, to combining SNA with SEM. Therefore, this is one of the unique contributions of this research. Second, by testing the moderating effect of in-degree centrality on the networking capability-access relationship, we go beyond the traditional focus of network-based research on the outcomes of networks (e.g., firm and innovation performances) to testing the influence of in-degree centrality on resource access as a 'theoretical mechanism' (Zaheer, Gözübüyük and Milanov, 2010).

Overall, this research recognises the lack of attention paid by scholars to the essential role of actors' embeddedness, as well as its value in impacting resource integration and accessing network resources. Examples of some of the few related studies are those of Gilsing *et al.* (2008), Hsueh, Lin and Li (2010) and Arranz, Arroyabe and Fernandez (2020). It can be seen that actors, including individuals and organisations, and their characteristics, for example, the position held in the organisation and firm size and age, are normally the main focus in network-based research (e.g., McGrath, Medlin and O'Toole, 2019; Eggers *et al.*, 2020). In the specific area of networking capability and value co-creation-related research, few studies concentrate on network position and its role within the business network (e.g., Jaakkola and Hakanen, 2013; Perks *et al.*, 2017; McGrath, Medlin and O'Toole, 2019), which prompted the following research question:

RQ3. How does actors' network position (in-degree and closeness centrality) moderate the relationship between networking capability and their ability to access embedded resources in the business network?

To this end, by integrating diverse theories i.e., the S-D logic perspective, the DCV of the firm and social network theory, the outline of a network-centric view of value co-creation proposes an integrated conceptual framework that examines the performance effects of the value co-creation process in digitalised business networks. This consequently supports the development of knowledge in the multiple fields of marketing, strategic management and network-focused research.

2.8 Summary

This chapter has provided a review of (i) the three components of value co-creation: what 'value' is; the actors (i.e., who it is for); and the digital engagement platforms (i.e., 'creation') which explain how value is co-created (Mahr, Lievens and Blazevic, 2014); (ii) the three aspects of value co-creation, namely the DART model, networking capability and network position, together with the theories which underpin them; and (iii) firm innovativeness as a value-based outcome, its drivers, antecedents and performance outcomes. Grounded in S-D logic perspective, the DCV of the firm and social network theory, this research conceptualises value as 'value-in-context', which is digitally co-created through the interactions and resource integration activities between multiple actors in the business network, as such enhancing firm innovativeness. In addition, the chapter has explained the importance of networking capability in managing the relationship portfolio in order to engage in the value co-creation process, and sheds light on the potential effect of network position obtained by actors as a result of their relationships on their ability to access embedded resources in the network. However, the literature review has revealed the lack of empirical evidence and the scarcity of research on value co-creation that is technology-enabled, especially from a holistic perspective, i.e., the business network.

To answer the overarching research question and the three sub-questions presented in sections 1.4 and 2.7, the following chapter (Theoretical Framework and Research Hypotheses) builds upon this one by further exploring the research constructs, namely networking capability, firm innovativeness, the DART model and network position, subsequently merging the two sets of literature derived from Chapters 2 and 3 to formulate the research hypotheses that examine how the technology-enabled value co-creation process increases firm innovativeness in a business network setting, and how actors' network position moderates the relationship between networking capability and their ability to access embedded resources in the business network.

Chapter 3. Theoretical Framework and Research Hypotheses

As mentioned in the literature review chapter (Chapter 2), contemporary marketing literature, particularly the S-D logic strand, emphasises the embeddedness of value creation in networks (Vargo and Lusch, 2010, 2017), asserting that value is co-created among various sets of actors. Typically, the co-creation of value emerges in interactions, joint collaborations and intangible resource integration (e.g., knowledge, skills, information, expertise and technology) among the actors in business networks, which results in mutual benefits (Prahalad and Ramaswamy, 2004; Vargo, Wieland and Akaka, 2015). A business network is a group of individuals, organisations and other stakeholders (i.e., actors) working together based on common strategic objectives (Kohtamäki and Rajala, 2016; Vargo and Lusch, 2016; Ng and Vargo, 2018). Underpinning S-D logic perspective and resource-advantage (R-A) theory (Hunt and Morgan, 1995), Vargo, Lusch and Akaka (2010), among other scholars (e.g., Hunt, 1995; Amit and Zott, 2001; Madhavaram and Hunt, 2008; Gummesson and Mele, 2010), have acknowledged the increasing interdependencies between the actors in business networks due to the rapid changes in the environment of business networks.

S-D logic perspective stresses that every organisation is part of a network or a context, performs activities and has resources; actors are involved in inevitable continuous adaption in business relationships and cannot be isolated from other actors in the network (Johanson and Vahlne, 2011; Achrol and Kotler, 2012). In effect, the value co-creation by the actors depends on the firm-level capabilities, competences and the scarcity of each organisation's resources (Ordanini and Parasuraman, 2011; Lusch and Nambisan, 2015; Vargo, Wieland and Akaka, 2015). Therefore, actors actively develop capabilities to build and maintain relationships with other actors (i.e., networking capability) in order to occupy a central position in the business network (Ford *et al.*, 2003; Mostafa, 2016; McGrath, Medlin and O'Toole, 2019).

The location of actors in the business network (network position) describes their portfolio of relationships, based on their ties (connections) with other actors in the business network (Abrahamsen, Henneberg and Naudé, 2012; Jaakkola and Hakanen, 2013). In the current research, network position is presented by in-degree and closeness centrality. In-degree centrality is the number of relationships directed towards the actor, while closeness centrality refers to an actor's proximity to other actors; higher closeness gives the actor a higher power of reference (Klepac, Kopal and Mri, 2014). Actors constantly seek to improve their position in the business network (Håkansson and Snehota, 1995) as this position affects their potential to access resources, build relationships and influence other actors (Corsaro *et al.*, 2012; Muller and Peres, 2019).

As noted in the introductory chapter (Chapter 1), despite the advances in the value co-creation literature in recent years, we have identified several research gaps. First, whilst there is a profusion of research on value co-creation in the dyadic relationship context, i.e., the B2C and B2B dyads, the research on value co-creation in the business network context is lacking (Vargo and Lusch, 2017; Hein *et al.*, 2019). Second, the research on the value co-creation process, especially the technology-enabled one, is scarce, and what exists remains theoretical in nature and lacks empirical evidence (Breidbach and Maglio, 2016; Hein *et al.*, 2019; Ketonen-Oksi and Valkokari, 2019). Finally, the effect of actors' embeddedness on their ability to access network resources required for the value co-creation process has not been sufficiently analysed (Laud *et al.*, 2015; Mele, Sebastiani and Corsaro, 2019). Taken together, these research gaps prompted us to ask the following questions:

In relation to networking capability:

RQ1. How can networking capability be a catalyst for innovativeness through a technology-enabled value co-creation process in a multi-stakeholder business network?

In relation to the value co-creation process in business networks and its impact on firm innovativeness:

RQ2. To what extent does the DART model affect firm innovativeness?

In relation to network position:

RQ3. How does actors' network position (in-degree and closeness centrality) moderate the relationship between networking capability and their ability to access embedded resources in the business network?

Answering these three sub-questions will in turn answer the main research question:

In a business network context, to what extent does networking capability affect the digitalised value co-creation process that results in innovativeness and how does the actors` network position influence this process?

To address these research gaps and answer the research questions, this chapter develops an overarching theoretical framework to explore a number of direct and indirect effects stemming from the literature review of dynamic capabilities, value co-creation, innovativeness, and networks. The relationships in the theoretical framework are discussed below.

3.1 Networking capability as an antecedent of the value co-creation process

Networking capability is actors' ability to initiate, develop, maintain and terminate business relationships (Mitrega *et al.*, 2012), as well as to utilise inter-organisational relationships, manage the collaboration process, and facilitate resource integration and synthesis (Walter, Auer and Ritter, 2006; Nordin *et al.*, 2018; McGrath, Medlin and O'Toole, 2019). This joint effort encourages synergetic cooperation, deploying and integrating external and internal operant resources (i.e., knowledge, skills, information, expertise and technology) in order to co-create value, aiming to strengthen innovation and competitiveness (Kohtamäki and Partanen, 2016; Quinton and Wilson, 2016).

Grounded in the DCV of the firm, numerous scholars such as Bai, Holmström and Johanson (2016), Mitrega *et al.* (2012, 2017) and Nordin *et al.* (2018) argue that networking capability conceptualised as a dynamic capability constitutes actors' ability to cope effectively with business interactions, build collaborative relationships, and integrate resources for value creation. We underscored earlier in the literature review chapter (Chapter 2) that research on value co-creation stresses that relationships and interactions are fundamental for the value co-creation process (Prahalad and Ramaswamy, 2004; Vargo and Lusch, 2004; Ng and Vargo, 2018).

As noted previously in Chapter 1 (Introduction), in a business network setting, we propose networking capability as the critical antecedent of the value co-creation process that is enabled by a digital engagement platform. We also argue that this incorporation of networking capability in the DART model extends its use to capture the technology-enabled value co-creation process beyond B2C and B2B dyads to include the various actors in business networks. The underlying reasons for choosing networking capability as an antecedent of the value co-creation process in business networks from among the others mentioned in section 2.5.2 are as follows.

First, value co-creation requires the actors to communicate (dialogue) with each other to constitute shared meanings, goals, and to clarify their common strategic objectives and any role ambiguity (Kohtamäki and Rajala, 2016; Vargo and Lusch, 2016; Ng and Vargo, 2018). Walter, Auer and Ritter (2006) argue that this dialogue is contingent upon the actor's ability to manage both their interpersonal and inter-organisational relationships. Taking the interpersonal aspect of the relationship portfolio, Mitrega *et al.* (2017) argue that networking capability imparts trust, empathy and commitment, which drive actors to engage in effective and interactive dialogue. On the other hand, in terms of the interorganisational aspect of the relationship portfolio, Anand and Khanna (2000), Mostafa (2016) and Arellano, Rebolledo and

Tao (2019) argue that developing a will for networking capability fosters collaborative communications between actors through mutually supportive interactions.

Second, since access to network resources is crucial for the value co-creation process to occur (Breidbach and Maglio, 2016; Ramaswamy and Ozcan, 2018b; Mele, Sebastiani and Corsaro, 2019), this emphasises that actors who possess networking capability are more capable of exploring and exploiting embedded strategic resources in the business network for improved value co-creation. In fact, Ng and Vargo (2018) argue that networking capability enables and constrains the resource integration during the value co-creation process. We will elaborate more on this point in section 3.1.2.

Third, we argued in section 2.3.3.2 that digital engagement platforms are one of the vital components of the value co-creation concept (e.g., Windahl and Lakemond, 2006; Pagani and Pardo, 2017; Ramaswamy and Ozcan, 2018a; Schiavone *et al.*, 2020). They not only allow actors to share and integrate their resources in one virtual place, but they also provide them with the ability to evaluate other actors` competences and resources (Cova and White, 2010; Nordin *et al.*, 2018). As a result, the actors are able to make an informed risk/benefit assessment, allowing them to select which resources to integrate and with whom they form collaborative relationships (Cova and White, 2010; Nordin *et al.*, 2018). However, actors cannot efficiently perform this risk/benefit assessment if they lack networking capability (Mu, 2013; Mitrega *et al.*, 2017; Jing and Mingfei, 2019).

Finally, scholars such as Madhok and Tallman (1998), Mitrega *et al.* (2017) and Nardelli and Broumels (2018) argue that both personal and inter-organisational relationships are not free of conflicts, opportunism and power plays. Therefore, Mu and Di Benedetto (2012), Pérez and Cambra-Fierro (2015) and Mitrega *et al.* (2017) assert that in order to mitigate such conflicts, networking capability allows the actors to develop close relationships and aids in developing trust. Consequently, this reduces uncertainty and encourages openness and information symmetry (Mu, 2013; Nardelli and Broumels, 2018), which in turn reduce the propensity for role conflicts, opportunistic behaviour and powerplay.

In the following sub-sections, we discuss the impact of networking capability on each component of the DART model.

3.1.1 The impact of networking capability on dialogue

The literature review revealed that networking capability is essential for (i) resource mobilisation and development (Thornton, Henneberg and Naudé, 2015); (ii) achieving resource (re-)configuration (Mu and Di Benedetto, 2012); (iii) exploiting existing inter-organisational relationships, and exploring new relationships with the actors in the business network (Mu *et al.*, 2017); (iv) fostering collaborative communication (Arellano, Rebolledo and Tao, 2019); (v) value creation (Vesalainen and Hakala, 2014); and (vi) value co-creation (Zhang *et al.*, 2015; Mostafa, 2016).

Since business relationships are seen *"as a productive resource for value creation and realization"* (Madhok and Tallman, 1998, p. 326), networking capability indicates that the actor is more likely to increase investment in "relational specific assets" (Madhok and Tallman, 1998; Zhang *et al.*, 2015). Such relationship-specific assets encompass transaction-specific expenditures or investments aimed at integrating the resources required to enable the process of creating and realising value (Madhok and Tallman, 1998). Accordingly, networking capability empowers the actors to be more competent in establishing and maintaining relationships in the business network, consequently enhancing the "collaborative communication" (Mohr, Fisher and Nevin, 1996) which aims to create a superior value proposition (Zhang *et al.*, 2015; Fang *et al.*, 2019).

Indeed, the ability to build and develop inter-organisational relationships and cope with these enhances actors' ability to engage in open dialogue with other actors in the business network (Mostafa, 2016; Ramaswamy and Ozcan, 2016). In essence, increasing the relationship portfolio in the business network leads to an increase in the dialogue with actors in order to (i) attract and influence relevant actors and resources (Nordin *et al.*, 2018), (ii) enable more effective coordination between actors (Boso *et al.*, 2013; Vesalainen and Hakala, 2014); and (iii) achieve more effective and efficient resource orchestration (Wales *et al.*, 2013).

Using the notion of the DCV of the firm, Walter, Auer and Ritter (2006) and Anand and Khanna (2000) argue that networking capability enhances the internal and external communications (dialogue) between actors. It provides actors with the ability to connect with others in mutually supportive interactions. In fact, networking capability provides formal governance mechanisms (Mitrega *et al.*, 2017), which take the form of knowledge sharing, linking resources, and mutual adjustments of aims and processes, and as such improve the communication between the actors in business networks. Moreover, taking the RV of competitive advantage and the DCV of the firm, Mitrega *et al.* (2017) argue that the interpersonal aspect of networking capability is fundamental for creating informal and formal governance mechanisms among actors, such as commitment, trust, empathy, and self-reflection, which in turn drive dialogue.

Dialogue is essential for providing "*a way of building a basis for mutual understanding and trust by uncovering the basic cognitive processes that underlay individual and group assumptions"* (Schein, 1993, p. 40). In other words, dialogue clears away any ambiguity over actors' needs, aims and goals and finds alignment between them to construct common goals and understanding (Sheth and Sinha, 2015; Marcos-Cuevas *et al.*, 2016). In addition, dialogue provides clarity over what constitutes 'value' for the other actors by establishing a higher level of learning about each other among the participants (Kotler, 2000). Networking capability plays a significant role in increasing actors' ability to establish open communications with stakeholders in the business network in order to develop a better understanding of stakeholders' needs and wants (Kohtamäki *et al.*, 2013; Kohtamäki and Rajala, 2016; Mostafa, 2016). It is therefore hypothesised that:

Hypothesis 1a: Networking capability is positively associated with dialogue.

3.1.2 The impact of networking capability on access

The DCV of the firm suggests that actors vary in their ability to access and control resources in business networks (Helfat *et al.*, 2007). In fact, the variation in firm performance among actors due to their networking capability enhances their ability to create, extend or modify the resource base (Helfat *et al.*, 2007; Mu *et al.*, 2017). Indeed, the DCV of the firm emphasises the necessity to have capabilities that allow the actors to exploit internal resources, as well as to access, leverage and configure the embedded resources in the business network (Teece, 2007; Mu *et al.*, 2017). However, the increased emphasis on creating capabilities and core competences in business networks suggests that the actors do not necessarily want to possess all the operant resources needed for success (Zacharia, Nix and Lusch, 2011). Instead, they engage in a collaborative process to access others' operant resources in order to exploit complementarities through resource integration (Grant and Baden-Fuller, 2004; Zacharia, Nix and Lusch, 2011), without fully absorbing all the available operant resources. In this respect, Bharadwaj *et al.* (2013) argue that the actors in business networks significantly invest in having timely access to diverse streams of operant resources, and extend these to different actors, especially their allies and key partners.

In line with the S-D logic perspective, networking capability encompasses the building of collaborative relationships with business partners and customers, in which the resources are integrated among the actors, consequently, co-creating value through interaction (Walter, Ritter and Gemüden, 2001; Mitrega *et al.*, 2012). In fact, the value co-creation literature emphasises the crucial role of interactions and management of relationship portfolios i.e., networking capability (Mitrega *et al.*, 2012) in order to access new resources and new actors in the business network for resource integration (Gummesson and Mele, 2010). To emphasise this point, the interactions among the actors represent the value co-creation process, providing those at the network level with the ability to integrate the operant resources (especially knowledge and skills) into higher-order resources (Vargo and Lusch, 2008b, 2017; Mele, Sebastiani and Corsaro, 2019), that boost their ability to increase their competitive advantage and innovativeness.

In this regard, networking capability has been identified as a significant skill (e.g., Zaefarian, Henneberg and Naudé, 2011; Cui and O`Connor, 2012; Thornton, Henneberg and Naudé, 2015) that enables actors to initiate, develop, maintain and terminate relationships in a way that increases their ability to access the external resources that are embedded in the business network. Similarly, informed by the DCV of the firm, Mu and Di Benedetto (2011, 2012), Mu *et al.* (2017) and Jing and Mingfei (2019) argue that networking capability enhances actors' ability to develop networks which increase the accessibility of external resources. In fact, they all assert that those with higher networking capability tend to have more access to resources than those with lower capability. The assumption is that if actors develop networking capability, they will gain more access to critical resources through building personal and inter-organisational relationships with actors who possess valuable resources. It is therefore hypothesised that:

Hypothesis 1b: Networking capability is positively associated with access.

3.1.3 The impact of networking capability on risk/benefit assessment

We argued in the above sub-section that according to the DCV of the firm networking capability increases actors' access to resources embedded in the collaborative relationships in the business network in order to enhance innovativeness, competitive advantage, and firm performance (Mu and Di Benedetto, 2012). Despite the aforementioned benefits of networking capability, the collaborative relationships are interspersed with some risks, such as role conflicts and ambiguity, the challenge of shared decision-making processes, conflicts of interest, opportunism, implementation challenges and power plays (Chowdhury, Gruber and Zolkiewski, 2016; Mitrega *et al.*, 2017).

The actors in collaborative processes are obliged to build consensus and common understanding prior to making decisions, which in turn might lead to challenges in implementing them (Kauppila, 2014). Therefore, based on the DCV of the firm, the ability to manage the relationship portfolio, and finding and selecting appropriate actors, is crucial to managing the uncertainty of the diversity of approaches, ideas and insights that are not well established amongst actors (Mitrega *et al.*, 2012; Mu *et al.*, 2017). From the social network theory (Freeman, 1979; Scott, 1988; Wasserman and Faust, 1994) perspective, by depending only on existing relationships, actors risk isolating themselves and losing access to potentially important resources in the business network held others (Burt, 1992; Mu, 2013). In other words, networking capability increases actors' ability to utilise new resources and capabilities at limited risk, without sacrificing the benefits from current relationships (Mu, 2013).

Based on the RV of competitive advantage (Dyer and Singh, 1998), the relationships in business networks involve both integration and some level of competitiveness. Networking capability provides the ability to anticipate threats embedded in the existing relationship portfolio, as well as the expected benefits through searching for promising opportunities in new relationships (Mitrega *et al.*, 2017). For instance, actors' selection as part of networking capability creates the potential for synergistic activities (e.g., resource integration) and minimises the risk of opportunistic behaviour (e.g., appropriation of knowledge) (Madhok and Tallman, 1998; Mitrega *et al.*, 2017). Networking capability serves to provide information about the actors, assess their capabilities, competences, resources, and value propositions (Mu 2013), which in turn increases the actors' ability to alleviate the associated risks of collaborative relationships (Ahuja, 2000b; Wassmer, 2010). Networking ability, by definition, increase actors' relationship portfolio (Mitrega *et al.*, 2012), which Ahuja (2000b) refers to as "embeddedness" in the business network.

The number of relationships (embeddedness) actors can form due to their networking capability results in better risk/benefit assessment of the potential actors with whom to establish and/or maintain relationships (Mitrega *et al.*, 2012; Mu, 2013). In fact, to make an informed risk/benefit assessment, actors should obtain information about others through interaction (Walter, Auer and Ritter, 2006). In effect, Ahuja (2000b) posits that highly embedded actors first obtain information regarding potential collaborations from current actors. Second, actors' embeddedness indicates their ability to connect with other highly embedded actors, and consequently access more resources. Finally, embeddedness indicates reliability; partnering with many actors "*reinforces their reputation as desirable collaborators*" (Ahuja, 2000b, p. 322) i.e., the attractiveness as a partner. Reliable and useful relational resources increase an actor`s ability to reduce the cost and time required to refine, improve or develop resources internally (Srivastava and Gnyawali, 2011). Hence, the possession of networking capability increases the propensity to select the 'right' actors with common goals and strategic objectives (Helfat *et al.*, 2007; Mu *et al.*, 2017). This in turn increases the actors' ability to mitigate risks by employing joint problem solving (McEvily and Marcus, 2005).

To this end, based upon the DCV of the firm, the RV of competitive advantage and the S-D logic perspective, as well as on previous work by scholars such as Ford (1980), Dwyer, Schurr and Oh (1987), Schurr, Hedaa and Geersbro (2008), Mu (2013), Mitrega *et al.* (2017) and Zaefarian, Forkmann *et al.*, (2017), we argue that networking capability increases actors` ability to make risk/benefit assessment. In turn, this provides the actors with the ability to (i) evaluate and select which others they can successfully collaborate with; (ii) assess their capabilities and competences; and (iii) identify and resolve conflicts as they arise in a collaborative effort, as a result being able to make an informative risk/benefit assessment (Mitrega *et al.*, 2012; Thornton, Henneberg and Naudé, 2015). It is therefore hypothesised that:

Hypothesis 1c: Networking capability is positively associated with risk/benefit assessment.

3.1.4 The impact of networking capability on transparency

As discussed previously, building on the DCV of the firm and informed by the RV of competitive advantage, networking capability (specifically identifying, building and maintaining new collaborative relationships) is important for managing the complexity of the relationship portfolio (Anand and Khanna, 2000; Mitrega *et al.*, 2012). However, in building collaborative relationships in order to access strategic resources in an efficient manner and at least cost, Madhok and Tallman`s (1998) underpinning of the transaction cost theory (Williamson, 1979) argue that the trade-offs between the cost-benefit of inter-organisational relationships might be associated with opportunistic behaviour/opportunism through a “Trojan horse” strategy (Hennart, Roehl and Zietlow, 1999). For instance, opportunistic behaviour comprises unfair appropriation of the potential commercialisation of new ideas and taking advantage of the openness among actors in the business network (Gulati, 1998; Mu and Di Benedetto, 2012). Transaction cost theory concerns the gross costs of making transactions in the business network, which include various elements such as production costs, the cost of building relationships, decision-making and planning (Madhok and Tallman, 1998).

Scholars such as John (1984), Mohr and Nevin (1990), Gulati (1998), Madhok and Tallman (1998), Mitrega *et al.* (2017) and Nardelli and Broumels (2018) posit that opportunistic behaviour occurs in business networks where power is centralised/formal; i.e., an asymmetrical flow of information, knowledge and resources. As noted in section 3.1.1, following the RV of competitive advantage the interpersonal aspects of networking capability are fundamental for creating informal, decentralised relational governance mechanisms such as inter-organisational trust and commitment (Pérez and Cambra-Fierro, 2015; Mitrega *et al.*, 2017). As such, networking capability plays a critical role in mitigating opportunistic behaviour by creating an appropriate climate for collaborative relationship management, which in turn increases openness and information symmetry among the actors (Cheng and Huizingh, 2014; Mitrega *et al.*, 2017).

Moreover, in accordance with the S-D logic perspective, Prahalad and Ramaswamy (2004) and Chowdhury, Gruber and Zolkiewski (2016) stress that collaborative relationships encourage information symmetry among the actors in business networks. In fact, Bai, Holmström and Johanson (2016), among others (Nätti *et al.*, 2014; Marcos-Cuevas *et al.*, 2016; Mostafa, 2016), argue that networking capability reinforces the ability to build mutual understanding, making each actor's role in value co-creation explicit through policies, agreements and guidelines. Consequently, networking capability drives the actors in the business network to be more transparent regarding (i) their capabilities and resources; (ii) the associated risks and benefits of the collaborative relationships (Pérez and Cambra-Fierro, 2015; Mitrega *et al.*, 2017; Mu *et al.*, 2017); and (iii) the intellectual property rights concerning *"who owns what intellectual asset"* (Lusch and Nambisan, 2015). It is therefore hypothesised that:

Hypothesis 1d: Networking capability is positively associated with transparency.

The following section moves the discussion on to the impact of the value co-creation process on firm innovativeness.

3.2 The impact of the value co-creation process on firm innovativeness

In today`s competitive global economy, innovations are only not confined to the organisation (Nambisan and Sawhney, 2007; Chesbrough and Bogers, 2014); instead, they emerge from the joint action and collaboration among the various actors in the business network (Lusch and Nambisan, 2015). The S-D logic perspective has recently emphasised this network-centric focus on innovation (Vargo and Lusch, 2017; Ng and Vargo, 2018). This perspective encourages organisations to engage in a highly collaborative framework with others to combine strategic resources, skills and competences (Lusch, Vargo and Tanniru, 2010).

The actors in the business network collaborate with the aim to co-create value among themselves (Lusch, Vargo and Gustafsson, 2016), which in turn reinforces competitive advantage (Romero and Molina, 2011) and enhances innovativeness (Phillips, Alexander and Lee, 2019). Innovativeness entails well-organised and effective interactions among the various stakeholders as a source for the required knowledge and operant resources (Cadogan *et al.*, 2006). In this regard, the DART model is the most appreciated theoretical framework for value co-creation (Schiavone, Metallo and Agrifoglio, 2014; Taghizadeh *et al.*, 2016). It not only focuses on the relationships between the organisation and customers, but also takes into account other stakeholders, such as business partners, competitors and independent inventors (Prahalad and Ramaswamy, 2004).

In line with Prahalad and Ramaswamy (2004), it is evident in the literature that the value co-creation process must be interactional. Therefore, it should provide the actors with interactive and ongoing communications (Barrett *et al.*, 2015; Lombardo and Cabiddu, 2017; Pagani and Pardo, 2017; Perks *et al.*, 2017), which are crucial for (i) transmitting knowledge and information flow; (ii) building a common understanding of shared goals; and (iii) clarifying each actor`s role in the process. Further, the literature strongly emphasises timely access to network resources as the cornerstone of the process (e.g., Barrett *et al.*, 2015; Breidbach and Maglio, 2016; Ng and Vargo, 2018; Ramaswamy and Ozcan, 2018b; Davey and Grönroos, 2019; Mele, Sebastiani and Corsaro, 2019). As has been noted, the DCV of the firm suggests that actors' ability to access and leverage the numerous resources that are embedded in the business network facilitates the value creation process and enhances competitive advantage and innovativeness (Teece, 2007; Monteiro, Soares and Rua, 2019).

In addition, several scholars such as Prahalad and Ramaswamy (2004), Mitrega *et al.* (2012) and Thornton, Henneberg and Naudé (2015) stress the importance of risk/benefit assessment when engaging in collaborative relationships in general, and in the value co-creation process in particular, as it is crucial for actors to evaluate and determine with whom they are collaborating, what their capabilities are, and what the risks associated with this collaboration are. Risk/benefit assessment also provides the actors with the ability to anticipate potential risks before becoming involved in the value co-creation process, such as role ambiguity (Tóth *et al.*, 2018), as well as during the process, such as opportunistic behaviour (Chowdhury, Gruber and Zolkiewski, 2016). Finally, dialogue, access and risk/benefit assessment necessitate the existence of transparency between actors, which in turn encourages new ideas, risk-taking (Ramaswamy and Ozcan, 2016) and the formation of mutual trust (Schnackenberg and Tomlinson, 2016).

In the following sub-sections, we discuss the impact of each component of the DART model on firm innovativeness.

3.2.1 The impact of dialogue on firm innovativeness

As mentioned previously, the dialogue is a sustained collective inquiry and fundamental process in the development of common understanding, and an instant knowledge-sharing mechanism among different parties that uncovers hidden meanings in interactions (Isaacs, 1993; Alegre and Chiva, 2008). In the business network context, Ballantyne (2004) postulates that for actors in the search for new ideas and discoveries, the dialogue is the pathway to new business knowledge. It is more than just an exchange of words; it is the basis for interactions. Dialogue becomes a multi-directional flow of information, supporting the value co-creation process by enabling mutual learning, creativity and innovation (Ballantyne and Varey 2006).

Furthermore, Ballantyne (2004) argues that the learning perspective of dialogue among actors is line with the notions of the theory of action (Argyris and Schon, 1978); actors in the business network "*make a clear distinction between what is said in communication (espoused theory) and what is done in action (theory in use)"* (Ballantyne, 2004, p. 117). Put differently, dialogue between actors is a learning process through which they become aware of the hidden assumptions in the communications with other actors, thus building mutual awareness. Moreover, dialogue suspends any hasty judgments about the drivers and motives for other actors to engage in the collaborative process (Ballantyne, 2004), which in turn facilitates the process of organisational development.

According to the theory of channel communication (Mohr and Nevin, 1990), dialogue between actors ('collaborative communication' in their article) is associated with more symmetrical power conditions, and enhances the outcomes of the collaborative effort (Mohr, Fisher and Nevin, 1996). Dialogue facilitates the opportunity for generating new ideas, knowledge and constructing common meaning, not only among the actors in the business network, but also within the organisation (Ballantyne, 2004). Consistent with these schools of thought, dialogue is emphasised by Prahalad and Ramaswamy (2004) as the most significant component of the DART model.

Similarly, as discussed in the literature review chapter (Chapter 2) of this study, the significance of dialogue in building common understanding and shared meanings among the actors in the business network is highlighted by different fields, such as interactive and relationship marketing (e.g., Kotler, 2000; Kotler and Pfoertsch, 2006; Kapferer, 2008). Accordingly, through dialogue, actors are more likely to co-create innovative outcomes such as products, services and processes, which are tailored to meet customers' and other stakeholders' needs and wants (Prahalad and Ramaswamy, 2004; Ayuso, RodrÝguez and Ricart, 2006).

It can be concluded that actors' engagement in collaborative partnerships propels the increase in the level of interactions among actors, which aims to foster dialogue. Dialogue allows the organisation to better understand the social, cultural and emotional contexts of the other actors in the business network, and as such provides knowledge that the organisation can use to enhance innovativeness. It is therefore hypothesised that:

Hypothesis 2a: Dialogue is positively associated with firm innovativeness.

3.2.2 The impact of access on firm innovativeness

Innovativeness requires actors to have timely and prompt access to numerous resources such as monetary, social, mental, physical, technical, knowledge and solutions, among others (Elinor and Gerard, 1998; Ballantyne, 2004). Building on the DCV of the firm, access to operant resources broadens the collaborative actors' perspective of other actors' capabilities, which may offer mutual business opportunities (Mitrega *et al.*, 2012; Mu and Di Benedetto, 2012). In fact, actors who engage in coordination and collaboration activities are likely to realise several strategic benefits, such as gaining access to the resources and capabilities of other actors in the business network that otherwise would not be available for the creation and/or development of the value propositions (Jap, 1999; Yaprak, Cavusgil and Kandemir, 2006). The DCV of the firm in this sense assumes that actors who can access and deploy strategic resources within the organisation and with the external network actors are likely to achieve greater success (e.g., enhanced firm performance) (Teece, 2007; Johanson and Vahlne, 2011; Helfat and Raubitschek, 2018).

Chesbrough (2003), Laursen and Salter (2006) and Bogers, Chesbrough and Moedas (2018) argue that actors who are more open to external resources access new ideas, information and capabilities, which help them to exploit innovative opportunities; consequently, they are more likely to have higher levels of innovativeness. Since the business network is formed of dispersed actors (Håkansson and Ford, 2002; Håkansson *et al.*, 2009), based on social network theory Laursen and Salter (2006) assert that in order to enhance innovativeness these actors seek to find new combinations of resources. Therefore, they need to scan the wide variety of knowledge resources that exist in the business network. Similarly, Desai (2018) and Raut (2018) emphasise that the interaction among the collaborative actors in business networks will allow them to gain operant resources previously inaccessible due to various constraints, such as firm size, cost or financial resources. In effect, business network actors' access to operant resources (such as knowledge, skills, information and expertise) will enhance their innovativeness and overall performance (Hult, Hurley and Knight, 2004; Goodman, Korsunova and Halme, 2017).

Previous research in the marketing literature concerning alliances, collaborations and innovation (e.g., Sivadas and Dwyer, 2000; Rindfleisch and Moorman, 2001; Wuyts, Stremersch and Dutta, 2004) emphasises that access to diverse resources through collaborations and resource integration is an important driver of innovativeness. Further, Cui and O`Connor (2012) argue that in the "innovation-related context", the benefits of resource diversity can only be realised through effective access, sharing and integration of knowledge, information and other operant resources. Similarly, based on R-A theory and the S-D Logic perspective, Gummesson and Mele (2010) assert that inter-organisational relationships are seen as an asset which grants actors sustainable access to numerous resources in the business network. In fact, in order to enhance innovativeness, actors should recognise the potential for accessing resources through collaborations and synergies. Indeed, novel ideas required for enhancing innovativeness are acquired through accessing information from the diverse actors in the business network (Moorman and Miner, 1997; Cui and O`Connor, 2012). Scholars (e.g., Amara and Landry, 2005; Nieto and Santamaría, 2007; Vega-Jurado *et al.*, 2008) have found that accessing diverse resources in the business network increases the novelty of innovations, which is in line with the SWT and structural holes theories. That is, actors' access to the operant resources increases their ability to gain new ideas and knowledge, which leads to mutual benefits and co-creates value, consequently enhancing innovativeness.

On the whole, based on (i) the suggestion of the S-D logic perspective that internal and external resources are integrated within the actors in the business network in the value co-creation process, aiming for mutual benefits and the generation of innovative value propositions (Vargo and Lusch, 2004, 2008b, 2017); (ii) the assertion of the social network theory (Granovetter, 1973; Borgatti and Halgin, 2011) that actors in the business network can discover innovation opportunities through access to diverse operant resources (such as knowledge, skills, information and expertise) embedded in the network, as argued by Håkansson and Ford (2002) and Håkansson *et al.* (2009); and (iii) the work of Barrett *et al.* (2015), Breidbach and Maglio (2016), Vargo and Lusch (2017), Ramaswamy and Ozcan (2018a) and Mele, Polese and Gummesson (2019), who acknowledge the roles that digital engagement platforms play in facilitating the value co-creation process through improving actors' ability to search, share, mobilise, match, and integrate the resources required to foster creativity and enhance innovativeness, it is therefore hypothesised that:

Hypothesis 2b: Access is positively associated with firm innovativeness.

3.2.3 The impact of risk/benefit assessment on firm innovativeness

No doubt, the collaboration between business network actors encompasses a degree of risk concerning resource integration (Cao and Song, 2016). However, Hult, Hurley and Knight (2004) argue that the actors engage in risk-taking situations (such as collaboration and resource integration) to exploit innovation opportunities. When engaging in a collaborative effort in order to co-create value, the actors in the business network demonstrate the willingness to commit towards the allocation of scarce resources (Prahalad and Ramaswamy, 2004). At the same time, in accordance with the S-D logic perspective and the value co-creation literature (e.g., Prahalad and Ramaswamy, 2004; Ramaswamy and Ozcan, 2014), they are obliged to share the perceived risks during the value co-creation process in term of resource availability, capital investment and the risks associated with the value propositions. Prahalad and Ramaswamy (2004) assert that when the actors are aware of such risks and address them, this will open up the doors to synergistic efforts that will result in increased innovativeness.

In fact, Das and Teng (2001) postulate that the collaborations between business network actors comprise two types of risks; first, performance risks pertain the full cooperation of the engaged actors in the collaborative process. Second, relational risks related to the probability that actors are committing themselves to the resource integration, and the consequences that may jeopardise the achievement of strategic objectives.

From the financial portfolio theory perspective (Markowitz, 1952) concerning the collection, the relationship between, and diversification of assets among actors, evaluating (assessing) the trade-off between risks and benefits is crucial for examining the synergies between actors. Risk/benefit assessment increases their capacity to cope with uncertainties and risks, as well as the opportunities associated with resource integration, so as a result enhances innovativeness and breakthrough innovations (Romero and Molina, 2011; Srivastava and Gnyawali, 2011).

By and large, risk and benefit assessment reinforces the actors' ability to effectively navigate through the integrated operant resources, *"connecting the actors with the appropriate value creating resources"* (Ramaswamy and Ozcan, 2014, p. 15). As such, risk/benefit assessment enables them to extract creative ideas and enhances the decision-making process, which in turn increases innovativeness (Gibb and Haar, 2010; Romero and Molina, 2011). It is therefore hypothesised that:

Hypothesis 2c: Risk/benefit assessment is positively associated with firm innovativeness.

3.2.4 The impact of transparency on firm innovativeness

In spite of the fact that *"providing transparency of actions on shared artifacts supports cooperative work"* (Dabbish *et al.*, 2012, p. 1278), creating a balance between transparency and avoiding the risk of leaking critical and sensitive information concerning the actor`s own core competence is a constant challenge (Hakanen, 2014). Conversely, sharing confidential information and knowledge is necessary for value co-creation (Hakanen, 2014); meanwhile, the business network actors may prefer a different level of openness in resource integration and knowledge sharing. However, in searching for innovation opportunities, the collaboration among the business network actors supports openness of information and increases transparency, therefore encouraging new ideas and risk-taking (Hurley and Hult, 1998; Hult, Hurley and Knight, 2004; Mostafa, 2016; Ramaswamy and Ozcan, 2016).

The DCV of the firm stresses the important role of actors' internal capabilities in leveraging network resources, and is crucial for intensifying innovativeness (Ahuja and Katila, 2004; Srivastava and Gnyawali, 2011). Actors combine their internal resources with external network resources by collaborating with others with rich resources, in the pursuit of the enhancement of innovativeness (Dyer and Singh, 1998; Srivastava and Gnyawali, 2011). However, actors in business networks are always faced with information and knowledge asymmetry, which might create uncertainty and opportunistic behaviour (Williamson, 1979; Mu, 2013).

The uncertainty in the relationships between actors concerns whether they have access to resources that enhance the value propositions, and whether the other actors in the collaborative relationship are reliable and trustworthy (Mu, 2013). In spite of that, innovation is often the outcome of collaborative effort among actors who pool and integrate their resources, rather than acting in isolation (Chesbrough, 2003; Bogers, Chesbrough and Moedas, 2018).

The alliance literature, as well as the innovation literature (e.g., Cheng and Huizingh, 2014; Mitrega *et al.*, 2017), asserts that developing relationship governance mechanisms such as openness, information symmetry, trust and commitment mitigates the threats of opportunistic behaviour and reduces uncertainty, which in turn increases innovativeness. The assumption is that informal safeguards such as openness regarding capabilities, competences and resources, are imperative in deterring potential opportunistic behaviour (Dyer and Singh, 1998; Mu, 2013).

By acting on the downsides of collaborative relationships (i.e., opportunistic behaviour, information asymmetry and lack of transparency) through openness (Chowdhury, Gruber and Zolkiewski, 2016; Kazadi, Lievens and Mahr, 2016), the actors in the business network develop close relationships that support fruitful interactions (Ngugi, Johnsen and Erdélyi, 2010; Pérez and Cambra-Fierro, 2015), consequently reducing uncertainty and information asymmetry in order to improve innovativeness (Mu, 2013; Nardelli and Broumels, 2018).

Further, the S-D logic perspective suggests that openness in engaging multiple actors in the value co-creation process makes collaborative effort become the norm; in effect, shared information and experiences increasingly become symmetric among the actors (Lusch, Vargo and O'Brien, 2007; Lusch and Nambisan, 2015). Information and resource symmetry entail increased interactions, induce learning through exchange (Vargo, Lusch and Akaka, 2010) and allows the actors to effectively identify the innovation opportunities and resources required for innovations.

Given the above discussion, transparency in the interactions among the business network actors implies the visibility of the operant resource by the engaged parties (Ramaswamy and Ozcan, 2014). Transparency leads to trust among the actors, which motivates them to share and integrate their core competencies, as, without trust, they would be reluctant to reveal innovative ideas and vital information (Laursen and Salter, 2006; Ramaswamy and Gouvillart, 2010). Consequently, collective transparency among the business network actors results in unlocking new resources of value (Vargo, Lusch and Akaka, 2010; Ramaswamy and Ozcan, 2014), consequently enhancing innovativeness (Ommen *et al.*, 2016; Pucetaite *et al.*, 2016; Zhong, 2018). It is therefore hypothesised that:

Hypothesis 2d: Transparency is positively associated with firm innovativeness.

In examining the impact of the DART model on firm innovativeness, the literature review included the work of Taghizadeh, Rahman and Marimuthu (2019), who examined the association between the value co-creation process and idea generation, which as a consequence will enhance service development performance. By taking the DART model as a whole to form the value co-creation construct, Taghizadeh, Rahman and Marimuthu found a positive association between value co-creation and idea generation internally (within the organisation) and externally (with end customers). Their study also revealed that it is the ideas generated within the organisation that enhance service development performance, and that the innovation ideas obtained from customers positively influence those generated internally. However, this research differs from that of Taghizadeh, Rahman and Marimuthu in two distinct ways.

First, Taghizadeh, Rahman and Marimuthu treated the components of the DART model as first-order constructs that generate one construct that represents the value co-creation process, although Prahalad and Ramaswamy (2004) acknowledge that these components build on each other and together they form the building blocks of interactions for value co-creation. To the best of our knowledge, there is no robust theoretical support for the notion that the DART model components are reflective (i.e., first-order) for value co-creation. Hence, we argue that they should be treated as separate constructs in developing hypotheses and during data analysis. Each component, namely dialogue, access, risk/benefit assessment and transparency, as has been discussed throughout this research, has its own distinct role in the value co-creation process as a whole, and its own discrete influence on the consequences of the process, such as firm innovativeness. This research, therefore, examines the impact of each component of the DART model on firm innovativeness separately.

Second, this study has taken into account the recent emphasis made by the S-D logic perspective on taking a holistic approach when examining the value co-creation process (Vargo and Lusch, 2017). Whilst Taghizadeh, Rahman and Marimuthu (2019) focused on dyadic relationships between organisations and customers, this study has considered the various stakeholders engaged in the value co-creation process enabled by a digital engagement platform, consequently enhancing the understanding of how the DART model components increase firm innovativeness for all the actors engaged in the process.

In conclusion, the building blocks of interactions and resource integration affect business network actors' ability to develop innovative products, services and/or processes. In the business network, constructing a common goal and understanding shared interests and mutual commitment; and ongoing dialogue and openness are vital throughout the value co-creation process (Mu, 2013; Kohtamäki and Partanen, 2016). In other words, interactive dialogue enhances the knowledge sharing and information flow, and builds understanding of the common goals and mutual benefits (Barrett *et al.*, 2015; Lombardo and Cabiddu, 2017). Accordingly, the easier the access to operant resources by the diverse set of actors in the business network, *"the richer the opportunity for resource integration"* (Lusch and Nambisan, 2015, p. 169). When dialogue and access occur, the actors' ability to perform an informative risk/benefit assessment increases, which in turn requires collective transparency among all the engaged actors. As a result, DART increases the business network's ability to enhance its competitive advantage and firm innovativeness. The following section discusses the moderating role of network position on the networking capability-access relationship.

3.3 The moderating role of network position

Network position relates mainly to social network theory and indicates the centrality of the actor among the other actors in the business network (Tichy, Tushman and Fombrun, 1979). Network position can be measured by several centrality measures such as degree and closeness centrality among others. It is worth noting that although degree and closeness are both centrality measures, each indicates a different type of importance (Scott, 2017). For instance, in the view of SNA scholars (e.g., Wasserman and Faust, 1994; Borgatti and Halgin, 2011; Scott, 2017), degree centrality is a simple count of relationships, without distinguishing between their quantity or quality. The actors might have high degree centrality, which indicates that they are connected to some actors more than others; however, this highly connected actor might be at the edge of the network and not really close to other actors. In contrast, another actor might have lower degree centrality but higher closeness to other actors, which in turn gives such actors greater ability to access resources and novel ideas than those with a higher degree. Thus, the moderation effect of network position presented by actors' centrality is hypothesised into two different hypotheses. Specifically, in this research network position is represented by two measures, namely in-degree centrality and closeness centrality. The decision on which centrality measure to use is contingent upon the research objectives and hypotheses (Borgatti and Halgin, 2011; Scott, 2017). We discuss the centrality measures and the justification for choosing only in-degree and closeness centrality to measure the network position in detail in section 4.6 of the research methodology chapter.

Studies in collaboration and innovation networks (e.g., Tsai, 2001; Bell, 2005; Arranz, Arroyabe and Fernandez, 2020) reveal the important role of actors' centrality in accessing resources in business networks. Muller and Peres (2019) argue that higher centrality indicates the importance of the network position and the ability to control information and knowledge flows, as well as to coordinate the resource integration. More specifically, network position affects actors' potential to access resources, build relationships and influence other actors (Abrahamsen, Henneberg and Naudé, 2012; Xu, Yan and Xiong, 2019; Eggers *et al.*, 2020).

Drawing on the network perspective and organisational learning, Tsai (2001) posits that the actors in business networks are not equally capable of acquiring knowledge and other intangible resources. The reason for the contrast in acquiring such resources is due to the differences between the actors in their ability to access resources as a consequence of their network position (Tsai, 2001; Bell, 2005).

The effects of in-degree centrality and closeness centrality on the relationship between networking capability and access are as follows.

3.3.1 The moderating role of in-degree centrality

In this research, the moderating role of in-degree centrality on the networking capability-access to resources is based upon previous work on two streams of research; the first being the networking capability-based research of Mu and Di Benedetto (2012), McGrath and O'Toole (2013) and McGrath, Medlin and O'Toole (2019), who discuss the importance of developing networking capability in enhancing firm performance in terms of different aspects such as NPD and operational processes. They argue that networking capability is developed by actors and not inherited naturally and also acknowledge the importance of examining how the network structure influences networking capability and its outcomes. They emphasise that understanding the potential of network relationships and network resources is essential for developing networking capability.

Similarly, Shu, Ren and Zheng (2018) and Eggers *et al.* (2020) assert that a higher level of networking capability provides actors with the possibility of actively and continuously investing in relationships with other actors in the business network. The ability to build relationships through networking capability allows them to connect their own resources with those of the actors they have built relationships with (Mitrega *et al.*, 2012; Zhang *et al.*, 2015). Further, McGrath and O'Toole (2013) argue that networking capability enables the actors to occupy a position that is more embedded in the business network. In effect, the number of relationships involving an actor (in-degree) means that they occupy a central position (Tsai, 2001; Scott, 2017). Moreover, actors` varying positions within the business network have a salient impact on resource flows (Hoang and Antoncic, 2003; Shu, Ren and Zheng, 2018).

The second stream of research on which the moderating role of in-degree centrality is based is the network-based research of Tsai (2001), Muller and Peres (2019) and Arranz, Arroyabe and Fernandez (2020), who discuss how actors` embeddedness in business networks affects different outcomes, such as innovation performance, business units innovation, and the exploration and exploitation of joint R&D projects. These studies, amongst others (e.g., Ahuja, 2000b; Sparrowe *et al.*, 2001; Bell, 2005; Yen, 2009; Zaheer, Gözübüyük and Milanov, 2010), argue that actors form interpersonal and inter-organisational relationships to learn new skills, maintain parity with competitors, discover innovation opportunities, and obtain access to necessary resources. In essence, these scholars posit that a high level of degree centrality denotes that the actor is connected with a high number of other actors, which provides them with access to a greater number of resources (such as new ideas and information). Consequently, actors who locate themselves in a more embedded network position will enjoy better performance and higher levels of innovativeness due to the number of variant and non-redundant resources they have access to (or control) through that position. These studies are based on theoretical arguments built upon the foundations of social network theory (e.g., Hoang and Antoncic, 2003; Zaheer, Gözübüyük and Milanov, 2010; Muller and Peres, 2019), as well as the results of empirical studies in which centrality measures were treated as variables in (i) linear regression models (e.g., Sparrowe *et al.*, 2001; Bell, 2005; Yen, 2009; Arranz, Arroyabe and Fernandez, 2020); (ii) the generalised linear model (AKA Poisson regression) (e.g., Ahuja, 2000b); and (iii) hierarchical regression analysis (e.g., Tsai, 2001).

Put differently, by occupying a central position in the business network, actors are more likely to access desired strategic resources, which enhances their ability to create new value (Tsai, 2001; Swaminathan and Moorman, 2009). However, Tsai (2001) argues that knowledge and resources are usually distributed unevenly in the business network; accessing resources is difficult for business network actors for whom pre-existing relationships are absent. In effect, it crucial for actors to occupy a central position (higher in-degree through direct relationships/ties) in order to gain access to a greater number of resources (Mahmood, Zhu and Zajac, 2011; Mani and Luo, 2015).

To this end, in-degree centrality emphasises the number of resources an actor can access in the business network by virtue of collaborative relationships; i.e., higher in-degree centrality indicates that the actor has a high number of partners (Ahuja, 2000b). This, in turn, indicates that the actors form numerous collaborative relationships, consequently increasing their access to a greater number of resources (Borgatti, Brass and Halgin, 2014; Xu, Yan and Xiong, 2019; Arranz, Arroyabe and Fernandez, 2020). Further, actors with a more central position typically enjoy greater visibility in the business network, a more favourable reputation, and greater ability to establish relationships with more distant actors (Soh, 2010; Mani and Luo, 2015). Consequently, a more central position enables actors to attract others to form collaborative relationships with, and therefore provides greater access to numerous strategic resources (Mani and Luo, 2015; McGrath, Medlin and O'Toole, 2019). It is therefore hypothesised that:

Hypothesis 3: In-degree centrality positively moderates the relationship between networking capability and actors` ability to access embedded resources in the business network. The positive association between networking capability and access increases as in-degree centrality increases.

3.3.2 The moderating role of closeness centrality

Closeness centrality refers to an actor's proximity to other actors; higher closeness gives the actor a higher power of reference (Klepac, Kopal and Mri, 2014). Actors with higher centrality in the business network are assumed to be better connected than others; i.e., they have easier access to resources and information (Muller and Peres, 2019). In other words, higher closeness strengthens the ability of an actor to engage in direct access to resources, and gives them a higher power of influence (Bandyopadhyay, Rao and Sinha, 2011). Donato *et al.* (2017) posit that higher closeness leads to more business indications, which therefore results in value co-creation.

Drawing on different theoretical approaches (e.g., social network theory, the DCV of the firm, the RV of competitive advantage, and alliances theory), network-related research sheds lights on how actors in business networks may intentionally affect the network structure through networking capability in order to achieve superior outcomes (e.g., Smith and Laage-Hellman, 1992; Mu and Di Benedetto, 2012; Thornton, Henneberg and Naudé, 2015). Specifically, networking capability provides the actors with the ability to manage their relationship portfolio and position themselves in a way that increases their ability to access strategic resources (Burt, 1992; Dyer and Singh, 1998; Mu *et al.*, 2017).

Social network theory stresses that actors with higher closeness centrality have more access to information and resources than peripheral network actors (Muller and Peres, 2019). In inter-organisational relationships in business networks, although gaining access to knowledge and intangible resources requires actors' networking efforts (Zhang *et al.*, 2015), actors occupying central network positions (with higher closeness centrality) enjoy better access to knowledge and desired strategic resources, which in turn increases their ability to be more innovative (Tsai, 2001; Muller and Peres, 2019; Xu, Yan and Xiong, 2019).

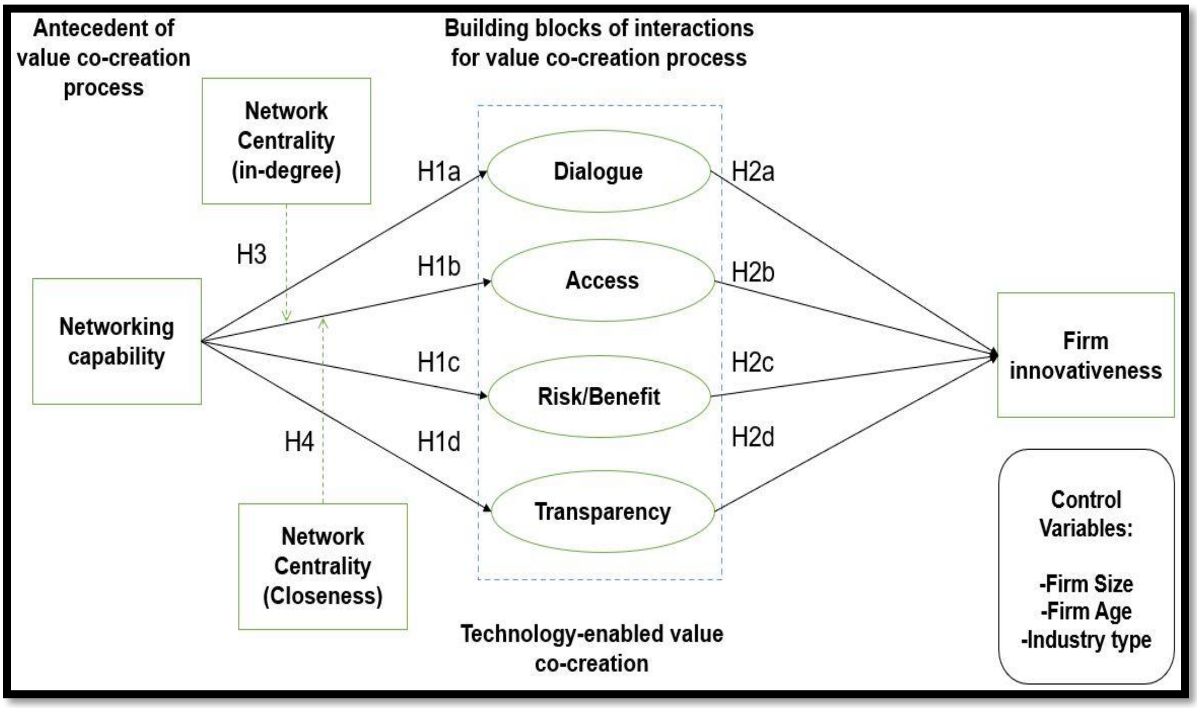
Borgatti and Halgin (2011) resemble business networks as \`pipe\` or \`flow\` model, which means that the relationships (ties) between the actors in the business network function as a distributor of knowledge and information. Borgatti and Halgin posit that the position and distance between the actors (closeness centrality) influence the extent and recurrence of information flows, which in turn affects the outcomes of the interactions (Soh, 2010). Therefore, actors occupying a central position are more likely to receive the knowledge and information flows earlier than those with a less central position (Haythornthwaite, 1996; Mani and Luo, 2015). In fact, highly interconnected actors can better use their network relationships to access resources and capabilities (Burt, 1992; Thomaz and Swaminathan, 2015; Arranz, Arroyabe and Fernandez, 2020). Consequently, actors with higher central position gain more advantages from the knowledge and information flows, since their central position increases their ability to easily access resources in the business network (Muller and Peres, 2019; Xu, Yan and Xiong, 2019).

Mani and Luo (2015) argue that network closeness centrality improves actors' ability to manage their relationship portfolios in pursuit of initiating, developing, coordinating and terminating business relationships, thereby improving access to resources. Further, research by Swaminathan and Moorman (2009) posits that actors occupying a central position in the business network have more access to information regarding other actors' resources, capabilities and abilities; this facilitates the ability to identify prospective actors with the required resources, reputation and reliability. In fact, Mani and Luo (2015) assert that "*increased network closeness centrality improves resource access and reduces the information asymmetries*" (p.12). It is therefore hypothesised that:

Hypothesis 4: Closeness centrality positively moderates the relationship between networking capability and actors\` ability to access embedded resources in the business network. The positive association between networking capability and access increases as closeness centrality increases.

The proposed theoretical model in Figure 3.1 outlines a graphical representation of the research hypotheses, constructs and variables that are investigated in the thesis. The theoretical framework encompasses networking capability as an antecedent of the value co-creation process, and firm innovativeness as a value-based outcome, while considering the moderating role of network structure in fostering the relationship between networking capability and actors` ability to access embedded resources in the business network. As such, by testing the proposed theoretical framework, it is possible to understand how actors' networking capability can be a catalyst for innovativeness through the value co-creation process, and how their network position strengthens the relationships between networking capability and access to resources. Taken together, the DART model is expanded beyond B2C and B2B dyads to examine inter-organisational relationships enabled by a digital engagement platform for innovation.

Figure 3.1: Theoretical framework.



Note: H = Hypothesis.

Table 3.1 presents the findings from key papers that examine the relationship between networking capability, the technology-enabled value co-creation process, firm innovativeness and firm performance in network-based research. The following chapter is the research methodology chapter, and moves from identifying the concepts in the proposed theoretical framework and developing the research hypotheses towards consideration of how these concepts and constructs and/or variables are explored in the methodology.

Table 3.1: Network-based research on networking capability and firm innovativeness - Key papers.

Domain	Author(s)	Network measure	Explanatory/ independent variable(s)	Outcome/ dependent variable(s)	Findings
Firm performance	Arellano, Rebolledo and Tao (2019)	N/A	Networking capability	Operational performance / innovativeness of NPD performance and processes	• Networking capability enables the actors to share their experience, best practices, ideas and information across the network, which in turn allows them to simultaneously improve NPD.
SMEs, digital platforms	Cenamor, Parida and Wincent (2019)	N/A	Network capability	Entrepreneurial SME performance.	• Platform-based network capability allows for efficient management of tangible resource flows and resource integration in a way that facilitates the innovation process and subsequently develops innovative and competitive value propositions
Innovation performance	Fang *et al.* (2019)	Network configurations	Network capabilities i.e., network structural capability and network relational capability	Innovation performance	• *"network structural capability has a greater positive impact on innovation performance than network relational capability does within an exploration-orientated network"* (p. 1638)

Table continues

Table 3.1 (Continued) Domain	Author(s)	Network measure	Explanatory/ independent variable(s)	Outcome/ dependent variable(s)	Findings
Value appropriation in industrial buyer-seller relationships	Jing and Mingfei (2019)	Firms' network embeddedness as a moderator	Network capability	Value appropriation defined as *"the relative and perceived proportion of the captured direct and indirect value from the value co-creation in the process of industrial buyer-seller interactions."* (p. 3179)	• Network capability positively and significantly enhances value appropriation via information acquisition, network resources and power, which has positive effects on the wider business network, such as firm innovativeness and access to new markets • Network embeddedness strengthens the positive association between networking capability and value appropriate in business networks
Value creation in buyer-seller relationships	Ford, Verreynne and Steen (2018)	Network embeddedness (customers and suppliers) as a moderator	Networking capability	Product and service innovation	• Networking capability strongly and positively supports the development of successful innovative value propositions; i.e., products/services. • "*Increasing vertical embeddedness with suppliers and customers simultaneously lowers firms' ability to introduce new products or services. Increasing vertical embeddedness may lock firms into non-innovative network positions."* (p. 50)

Table continues

Table 3.1 (Continued) Domain	Author(s)	Network measure	Explanatory/ independent variable(s)	Outcome/ dependent variable(s)	Findings
New venture performance	O'Toole and McGrath (2018)	Network position	Networking capability	Joint strategic innovations	• Networking capability allows firms to acquire and mobilise the various network resources and engage in interactive network activities aimed at joint strategic innovations; i.e., providing high performance innovative products at a low cost
Opportunity discovery in social networks	Shu, Ren and Zheng (2018)	Network centrality as a mediator	Networking capability as a second-order construct formed by network orientation, network building, network maintenance and network coordination	Opportunity discovery	• There is a positive and significant relationship between networking capability and opportunity discovery, which in turn has an impact on innovation • Network centrality positively and significantly mediates the positive association between networking capability and opportunity discovery
Alliance management and entrepreneurship	Parida *et al.* (2017)	N/A	Networking capability (five dimensions), namely coordination, relationship skills, partner knowledge, internal communication and building relationships	Innovativeness, customer performance, sales performance and innovation performance	• Networking capability formed by the five dimensions i.e., coordination, relationship skills, partner knowledge, internal communication and building relationships, positively and significantly impacts firm innovativeness, which leads to enhancement of firm performance

Table continues

Table 3.1 (Continued) Domain	Author(s)	Network measure	Explanatory/ independent variable(s)	Outcome/ dependent variable(s)	Findings
Industrial brand equity and customer value	Zhang *et al.* *(*2015)	N/A	Networking capability as a value-focused capability	Customer value as a performance/value-based outcome	• Networking capability builds customer value as a performance outcome directly via the value co-creation process
NPD performance	Mu (2014)	Network structure	Networking capability	NPD performance and firm innovativeness	• Networking capability increases firm innovativeness in terms of NPD performance and process development • Network structure positively and significantly mediates the positive association between networking capability and firm innovativeness.
New venture performance	Mu (2013)	Network position	Networking capability	Innovative value and economic rents	• For firms to appropriate various types of economic rent, networking capability is critical to manage network relationships and leverage network resources in order to innovate, develop and create value.
Relationship portfolios	Cui and O`Connor (2012)	N/A	Alliance portfolio resource diversity due to networking capability	Firm innovation	• Resource diversity due to the relationship portfolio can only benefit actors` innovations if they are shared and integrated among them

Table continues

Source: Own elaboration

Chapter 4. Research Methodology

This chapter aims to describe the research design and provides a clear understanding of the research methodologies employed to answer the research questions. In addition, the philosophical issues and paradigms concerning the research are presented. Following this, the pilot studies are presented, together with the reasons why further data collection was conducted in different empirical settings. The chapter then provides a detailed plan of how the main dataset was collected. It also explains the quantitative methodologies used to analyse the data, namely CB-SEM and SNA, and discusses how the research dealt with any anticipated endogeneity and CMB issues. Finally, the chapter presents the measures and control variables.

4.1 Philosophical issues and paradigms

In social sciences, the way research is conducted in terms of choosing the research philosophy and paradigm is affected by the nature of the phenomena under investigation (Saunders, Lewis and Thornhill, 2007). The research paradigm represents the philosophical assumptions about the ontology (i.e., what is reality?) and epistemology (i.e., what is knowledge?) and concerns the nature of the relationships (degree of involvement) between the research and the objects under investigation. Further, the methodology is the plan of action (i.e., the approach) undertaken by the researcher to examine the 'reality' of the phenomena. Axiology refers to the study of value, and concerns whether or not science is value-free (Walsh and Wingens, 2003). In other words, the research paradigm represents a whole system of thinking in order to answer the research questions, and each paradigm has its distinctive philosophical assumptions (Neuman, 2013). The varying perspectives about reality and knowledge among the research paradigms reflect their methodology and methods.

There are three main paradigms in social science studies, namely the interpretivist, positivist and critical, each with its own philosophical assumptions regarding ontology, epistemology, axiology and methodology. Understanding the philosophical assumptions underpinning the research is crucial in order to adopt a suitable methodology and methods to conduct the research. As shown in Table 4.1, the interpretivist paradigm, also known as the qualitative, concerns the exploration and building of a clear understanding of the phenomena under study, aiming for theory development (Walsh and Wingens, 2003). The positivist paradigm, also known as the quantitative, seeks to explain existing theories and generalise the study findings after accepting or rejecting the hypotheses. The ability of the positivist paradigm to generalise the study findings is due to the fact that the validity and reliability of the numerical data are analysed statistically to generated accurate results (Creswell and Clark, 2007).

Collins and Hussey (2003) argue that qualitative research has several disadvantages compared to quantitative research; for instance, (i) unlike quantitative research, the results in qualitative research are biased, as they are influenced by the researcher`s perspective; (ii) data collection and analyses are often time-consuming, while quantitative research can gather a great amount of numeric data in relatively more time- and cost-efficient ways; and most importantly (iii) while conclusions are generalisable in quantitative research, they cannot be generalised in the qualitative approach (see Table 4.1). Collins and Hussey (2003) and Creswell (2009) argue that quantitative research also faces certain pitfalls. For instance, researchers' focus on testing theories and hypotheses might lead to them missing out on a phenomenon. In addition, quantitative research often requires researchers to acquire great experience in numerical data analysis and purchase expensive tools and software packages.

The critical paradigm concerns the synthesis between the qualitative and quantitative research, in a way that overcomes their weaknesses by focusing on their strengths (Creswell and Clark, 2007). It is worth clarifying here that in social sciences different terms have been given to the critical paradigm in research, such as mixed research, multiple methods, multi-methods, blended research, triangulated studies, and integrative research (Harrison and Reilly, 2011). Mixed method and multi-method are the most common terms in marketing research (Harrison and Reilly, 2011). However, the mixed method research literature (e.g., Creswell *et al.*, 2003; Creswell and Clark, 2007; Johnson, Onwuegbuzie and Turner, 2007) has distinguished between the mixed method and multi-method in the following way. Mixed methods refer to the use of qualitative and quantitative data in the same study. On the other hand, multi-methods mean that the study is using two or more types of the same sort of data, whether qualitative or quantitative. For instance, a qualitative study can use ethnography and case study, while a quantitative study can use experiments and surveys (Creswell and Clark, 2007).

The critical paradigm, rather than being restrained by specific paradigmatic assumptions, is led by the research questions and research aims (Johnson and Onwuegbuzie, 2004). As this research aims to examine hypotheses derived from existing theories, i.e., S-D logic, the DCV of the firm and network theory, with the aim to explain them, this research has a tendency to adopt the philosophical assumptions of the critical paradigm, specifically the multi-method approach, for several reasons. First, due to the explanatory nature of the research questions in this study (i.e., testing specific relationships between the study variables), a multi-method quantitative research design avoids some of the pitfalls and limitations of qualitative-based research design mentioned in this section.

Second, the main aim of this research is to develop and empirically test a holistic conceptual framework to examine the performance effects of technology-enabled value co-creation in a business network context. Additionally, the moderation effect of actors' network position (in-degree and closeness centrality) on the networking capability-access relationship is examined. The use of multi-method quantitative research design serves this purpose in this study because the research has to collect two types of quantitative data using two different methodologies, namely SNA and SEM. The SNA is guided by the nominalist approach (Laumann, Marsden and Prensky, 1983) (see section 4.6.2), which allows the research to (i) identify and map the actors (Law, 2000), as well as the resource flow of, for example, innovation ideas in the network; (ii) generate the parameters required for the construction of the variables for the following analysis phase, i.e., CB-SEM; and (iii) add more clarity to the CB-SEM analysis results by interpreting them through the lens of social network theory. The CB-SEM method helps to explain the parameters generated from the SNA and test the direct and indirect effects sequentially among the variables. Appendix 7 presents a methodological review of a number of empirical studies, from which the key empirical papers that inspired the methodology used in this study are presented.

Third, the logic (reasoning) of the critical paradigm can be deductive, inductive, and/or abductive reasoning. In deductive reasoning, theory and hypothesis testing are conducted in order to link them with the conclusion. In the inductive approach, multiple premises (i.e., discovery of patterns) that the researcher has found or believes to be always true are combined to reach a conclusion (Johnson and Onwuegbuzie, 2004). Hence, the conclusion derived from inductive reasoning is uncertain (i.e., there is a possibility that it is false). Finally, abductive reasoning starts with observations to uncover the best explanations for understanding phenomena; however, the conclusion is not guaranteed to be true from the research hypotheses (Morgan, 2007). In essence, the adaption of a deductive approach associated with the critical paradigm is appropriate here because it is used in most forms of quantitative research (Johnson and Onwuegbuzie, 2004). In addition, it assists researchers to examine whether the data are consistent with previously identified theories and/or hypotheses constructed by the researcher. Finally, as outlined in Chapter 1 (Introduction) and Chapter 2 (Literature Review), specific to technology-enabled value co-creation, empirical research on this topic, especially the quantitative aspect, is scarce, leading to the call for more explanatory and quantitative-specific research that leads to generalisation (Breidbach and Maglio, 2016; Hein *et al.*, 2019; Ketonen-Oksi and Valkokari, 2019).

Table 4.1: Interpretivist paradigm versus positivist paradigm.

	Interpretivist	Positivist	Critical
Research type	qualitative	quantitative	mixed or multi-methods
Purpose	theory development	theory testing	mixed
Research aim	focus is on meanings rather than measurements	measures and explains phenomena which aim to explain the relationships between the study variables	critically examines realities from cultural, social, economic and political stances
Reasoning/ logic	inductive	deductive	deductive, inductive, and/or abductive
Axiology	science cannot be value-free; the study is influenced by the researcher's own values	positivist methodology is neutral; facts and values are detached, hence the generated knowledge is absolute and value-free	stresses the inseparability of facts and values; knowledge is not value-free
Ontology	reality is perceived differently from one person to another	reality is objective and separate from the researcher	realities are socially constructed entities (i.e., altered by human actions)
Epistemology	subjective, and posits that it is impossible to separate the researcher from what is being researched (i.e., biased)	stresses the neutral role of the researchers (objective) and their detachment from what is being researched (i.e., unbiased)	based on real-world phenomena, i.e., subject epistemology and objective reality
Methodology	exploratory, e.g., ethnography	explanatory (causal explanation)	a synthesis of both qualitative and quantitative methods
Methods	e.g., semi-structured or unstructured interviews	systematic and highly organised; e.g., surveys and structured interviews.	mixed or multi-methods
Data type	qualitative (e.g., words)	quantitative (numerical data)	mixed and/or multi-faceted
Generalisation	contextual understanding	facts based on data, yielding a foundation for generalisation	depending on the methods applied

Source: Adapted from: Collins and Hussey (2003), Creswell (2003, 2007, 2009) and Benton and Craib (2011).

As indicated previously, based on our literature and methodological reviews, combining CB-SEM with SNA is relatively new, especially in the marketing discipline. Therefore, to ensure the robustness of our multi-method approach and the consistency of the units of analysis, two pilot studies were conducted on two business networks, namely FMCG and the hospitality industry. These pilot studies are discussed briefly in the following section.

4.2 Pilot studies

This section discusses the pilot studies conducted prior to finalising the theoretical framework and choosing the main networks for the research. The aim of conducting these studies was to discover the issues related to upcoming SNA and SEM analysis, and consequently limiting these when analysing the main business networks for the research.

4.2.1 Empirical setting of the pilot studies

We set a number of selection criteria in order to choose the business networks for our case studies. First, the network should be formed by different organisations located in different places (local and/or international). Second, the business network should be centralised (having at least one large organisation (i.e., hub). Finally, the organisation should have a digital engagement platform more sophisticated than simple types of ICT such as emails and teleconferences, from which different actors in the business network such as customers, vendors, suppliers and other stakeholders could provide their input in the value co-creation, resulting in goods and/or service innovation.

The empirical setting for the first case study is a FMCG business network consisting of six organisations distributed in different cities across eight countries (i.e., Bahrain, Iraq, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates). The business network consists of four major strategic business units (SBUs) located in four countries of these eight countries, namely Jordan, Kuwait, Saudi Arabia and the United Arab Emirates. The organisations operate in different sectors: logistics, packaging, retailing, wholesaler and manufacturing. The products offered to the end-customers are categorised as dairy, juices, ice-cream and culinary items.

The FMCG business network digital engagement platform consists of different parts. First, each SBU has a digital engagement platform where they collect the intangible resources from customers in the areas they operate in, through online brand communities such as Facebook, Instagram, Twitter and the company website. The resources are then treated as inputs on the SBU digital engagement platform, allowing the local business partners to engage with and access these resources. The inputs into the four SBU digital engagement platforms are processed, then inserted into the main digital engagement platform managed by headquarters (the hub), where all the resources are processed, and the decisions made regarding marketing strategies and goods innovations.

The empirical setting for the second case study is a hospitality business network consisting of 27 organisations distributed in different cities across nine countries (i.e., Cyprus, Egypt, Jordan, Morocco, Palestine, Saudi Arabia, Turkey, and the United Arab Emirates). The organisations operate in different sectors in the hospitality business network, namely tour operators (domestic, inbound and outbound), travel agents, destination management companies, transportation (airlines and car rentals), accommodation, and medical clinics (hair transplants, dental transplants and plastic surgery). The clients of these companies target different types of tourism, such as leisure, business, adventure, culture, religion and medical tourism.

The hospitality business network has one digital engagement platform that has several features, which allows the actors to engage in collaborative relationships and integrate their resources in order to develop offerings for the clients. The actors insert the available resources into the platform, including information regarding clients' needs and wants in different markets, demand levels and competition. Although all the actors have access to the platform, the level of benefits derived from it varies according to the actors ranking. The digital engagement platform offers the following rankings, according to the level of deposit the actors put in. Rank A: deposit = $100K; rank B: deposit = $75k; rank C: deposit = $50K; and rank D: deposit = $25K. For instance, an actor with rank A will have the privilege of purchasing services on credit and paying after a week, while a rank C actor can purchase fewer services on credit and has to pay within 3 days. The sampling method and procedures of the pilot studies are discussed in the following section.

4.2.2 Sample and procedures of the pilot studies

Before administering the final survey to our research sample, we piloted it after translating the items from English into Arabic in order to test the respondents` understanding of the questions, explain the aim of the study, inform about our SNA, and ensure that the business network`s digital engagement platform met our selection criteria. We conducted 17 structured interviews with participants in managerial and tactical roles (seven participants in Jordan, five in Kuwait, and five in the United Arab Emirates (UAE)) across different sectors; i.e., hospitality, FMCG, architecture and planning, and IT solutions. The interviews and survey administration took place between the 24th of October 2018 and 28th of January 2019.

Based on the 'follow-the-actor' approach of actor-network theory (ANT) (Law, 2000) and the literature review of SNA, the survey included a question asking the participants to "Please identify up to 10 people who are important to you in your business network by mentioning their company name". Each participant was asked to send the web-based survey link to those they identified in their response in order to map the business network and track the resource integration activities. The survey consisted of 52 questions (items) asking about the theoretical model variables (direct effects and mediation), in addition, we included 21 questions in the survey for SNA.

We received data from 290 identified respondents, with no missing data, so we closed the survey concerning the hospitality business network after the 290th response had been recorded in order to obtain an identical number of responses to the other business network (FMCG) for the purpose of comparing the results between the two business networks at a later stage. The 290 responses from each business network were later subjected to SNA using the Gephi 0.9.2 software package in order to extract the network position measures. The network position constructs acquired from SNA were then inserted into the measurement model with the remaining study constructs in order to perform CB-SEM using IBM AMOS 25. Although the business networks met our selection criteria and sample size requirement for performing SEM, the research had to discard these data, since the survey asked the participants to give ten names from their business network, but they named a great number from their own organisation, as shown in Appendix 8, so there was a significant contrast in the participants' distribution in each business network. In turn, this made the unit of analysis at the individual level, rather than firm-level. Therefore, we enhanced our selection criteria and the procedures for collecting the research data in the main empirical settings of this research, as discussed in the following section.

4.3 Empirical setting of the main study

The empirical setting of the research is two business networks in the MENA region. These will then form two different case studies; the first is an FMCG business network that allows capture of the technology-enabled value co-creation process for products (tangible goods).

The importance of firm innovativeness and its positive impact on competitiveness and firm performance is well established in developed countries. However, research on value co-creation in developing and emerging economies is scarce, with just a few theoretical and empirical studies (e.g., Mostafa, 2016; Taghizadeh, Rahman and Marimuthu, 2019; De Silva *et al.*, 2020) focusing on this area. Recent literature on innovation and value co-creation (see Kafouros and Forsans, 2012; Adomako, Amankwah-Amoah and Danso, 2019; De Silva *et al.*, 2020) suggests that actors in developing and emerging economies (i) seek to connect and collaborate with various actors across different contexts in order to co-create not only economic value, but also social innovations; (ii) produce value propositions to sell to actors in developed countries; (iii) rely on actors from developed countries to access new knowledge and technologies required for value proposition development; and (iv) increase their R&D investment and innovation activities to cope with the rapid increase in competition as a result of globalisation and the advances in ICTs . Therefore, specific to the developing and emerging economy context, this study endeavours to provide clarity on how networking capability and network structure affect the value co-creation process, which in turn enhances actors` firm innovativeness.

The FMCG business network produces several product lines, such as culinary items, coffee, juice, baby food, breakfast cereals, ice-cream, confectionery, bottled water, and dairy products. The network is formed by an integrated supply chain (vertical and horizontal integrations). Vertical integration includes raw materials, suppliers, food processing and manufacturing, distribution, packaging, transportation and logistics, and wholesalers and retailers. Horizontal integration is among the actors on the same level e.g., competitors. The network encompasses other stakeholders outside the supply chain, such as marketing agencies, resources and waste recovery, and financial institutions. The actors were distributed across 13 countries in the MENA region, namely Algeria, Bahrain, Jordan, Kuwait, Lebanon, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Syria, Tunisia, and Turkey.

The second is a hospitality business network for capturing the same process for services. The hospitality business network comprises different types of tourism, such as leisure, business, adventure, cultural, historical, religious, and medical. The organisations operate in different sectors in the hospitality business network, such as tour operators, travel agents, destination management companies, transportation (airlines and car rentals), accommodation (hotels, bed and breakfast, shared accommodation), and medical clinics (e.g., hair transplants, dental transplants, and plastic surgery). The actors in the hospitality business network were distributed across 12 countries in the MENA region, namely Egypt, Jordan, Kuwait, Lebanon, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Tunisia, Turkey, and the UAE.

Testing our theoretical framework across different industries will further strengthen the ability to generalise the results of the research. The sampling procedures are explained below.

4.3.1 Sample and procedures of the main study

To mitigate the issues encountered with the pilot studies, the research employed the following enhanced criteria for selecting the business networks most appropriate for the case studies.

1. The business network should have a digital engagement platform, more sophisticated than simple types of ICT such as teleconferences and emails (Breidbach and Maglio,

2016) and that is currently used for value co-creation activities (Frow *et al.*, 2015). This platform should enable actors to:

(i) Engage in multi-directional dialogue (Ramaswamy and Ozcan, 2016).

(ii) "*Shape(s) the ease with which actors can access diverse resources for resource integration*" (Lusch and Nambisan, 2015, p. 166) and value propositions (goods and services) innovation.

(iii) Integrate the various kind of resources (e.g., knowledge, information, skills) required for the value co-creation process (Perks et al., 2017).

2. Given that business networks are the context of the research, they should be formed by different organisations situated in different locations (local and/or international) and have introduced products and/or services innovations at least twice (Fu, Wang and Zhao, 2017).

The following section discusses the data collection and research sample. It begins with a discussion of the ethical approval granted by the University of Kent for the research before the data collection was undertaken, followed by a discussion of the procedures involved in choosing the research sample. Finally, the section presents the steps undertaken to recruit the participants who will help generate the final datasets for analysis in the next chapter.

4.4 Data collection and research sample

Before data collection, following the general data protection regulation (GDPR) guidance for researchers and the University of Kent Ethics Code, ethical approval was granted by the Kent Business School Ethics Committee (KBSE No: 1346) on 20 September 2019 to conduct the research by distributing a link to a web-based survey using the Qualtrics platform. The survey was written in three languages: English, Arabic and Turkish (see Appendix 9). To ensure that the participants received it in the language they were more comfortable with, we (i) activated the option on Qualtrics that displays the survey in the same language used by the participant`s web browser; and (ii) enabled participants to change the language by using the language icon on the cover page of the survey. The translation of the survey from English to Arabic was done by the researcher, as Arabic is his native language, while that from English to Turkish was done by a professional company and piloted with native speaker Turkish friends.

We followed the selection criteria mentioned in section 4.3.1 above in choosing the FMCG and hospitality business networks. As the population size of our research was unknown, we followed Kline's (2011) recommendation for determining suitable sample size in order to perform SEM by adopting the rule of thumb of 5 to 10 participants for each item. The survey

(Appendix 9) consisted of 29 questions (items) which asked about the theoretical model constructs (direct effects) to answer the first and second research questions:

RQ1. How can networking capability be a catalyst for innovativeness through a technology-enabled value co-creation process in a multi-stakeholder business network?

RQ2. To what extent does the DART model affect firm innovativeness?

and to test the direct effect hypotheses:

Hypotheses 1a-d: Networking capability is positively associated with DART.

Hypotheses 2a-d: DART is positively associated with firm innovativeness.

Applying the aforementioned rule of thumb, an acceptable sample size for each case study was (5*29 = 145 participants). In addition, we included two questions in the survey regarding SNA in order to answer the third research question:

RQ3. How does actors' network position (in-degree and closeness centrality) moderate the relationship between networking capability and their ability to access embedded resources in the business network?

and to test the moderation hypotheses:

Hypothesis 3: In-degree centrality positively moderates the relationship between networking capability and actors` ability to access embedded resources in the business network. The positive association between networking capability and access increases as in-degree centrality increases.

Hypothesis 4: Closeness centrality positively moderates the relationship between networking capability and actors` ability to access embedded resources in the business network. The positive association between networking capability and access increases as closeness centrality increases.

The first SNA question asked the participants to "please identify up to 10 people who are important to you in your business network by mentioning their company's name" (see Appendix 9), provided that these persons were from outside their own company, and each of them worked for a different company. Similar to the pilot studies, each participant was asked to send the web-based survey link to the people they identified in their response. However, in contrast to the pilot studies, the survey urged the participants not to take part in the survey again if they had received it from another person who mentioned them in their own survey. In fact, the online-based survey has a function to terminate participation if 'yes' is ticked for the following question: Have you participated in this survey before?. In addition to this self-elimination function, we screened the datasets using Microsoft Excel 365 to ensure that we did not receive multiple responses from the same participant by checking that each company name was mentioned once before assigning a numerical code to it.

The SNA question allowed us to map and construct the business networks, detect the relationship directions, and to track the flow of resources (Wickramasinghe and Bali, 2009). Furthermore, by giving the participants a relatively wide range of names to mention, instead of asking them to report a fixed number (e.g., ‘mention three names’), the research mitigated the issues of reliability and measurement errors associated with SNA measures (Mouton, Blake and Fruchter, 1955a; Wasserman and Faust, 1994), as discussed later in section 4.6.4.3).

The data collection took place between October and December 2019 through an online-based survey using the Qualtrics platform. In our online-based survey, we activated the force response option, which reminds participants if they have missed any question, in order to minimise the possibility of missing data, and to obtain complete responses. Four weeks after launching the survey, we sent a reminder to the participants to complete it and to share the link with the people they mentioned in their response. One week after the reminder, the response rate increased by 12 per cent, so we sent another reminder two weeks later and waited until the end of December. By this time, no more responses had been recorded, so the survey was closed. For the FMCG business network, a total of 331 valid surveys were received out of the 348 submitted; 17 were excluded for being incomplete. For the hospitality business network, a total of 319 valid surveys were received out of 329 submitted; 10 were excluded for being incomplete. The average time taken to complete the survey was 8.5 minutes. Since the data were collected in two stages (waves), the non-response bias test conducted is discussed in section 5.2. Non-response bias occurs *“when a selected individual cannot be contacted or refuses to cooperate”* (Moore, 1996, p. 212), leading to an unrepresentative sample which jeopardises the accuracy of the data analysis (Armstrong and Overton, 1977). One of the most common types of non-response bias in marketing research is *successive waves* of a survey, which occur when the researcher sends reminders (follow-ups) as a stimulus for respondents who have yet to complete their surveys (Armstrong and Overton, 1977; Moore, 1996). Armstrong and Overton (1977, p. 397) argue that *“persons who respond in later waves are assumed to have responded because of the increased stimulus and are expected to be similar to nonrespondents”*.

The following section discusses SEM and the reasoning for choosing this statistical technique as part of the data analysis and for assessing the research hypotheses.

4.5 Structural equation modeling (SEM)

SEM is one of the most popular quantitative methodologies and is widely used by scholars and practitioners in social sciences and psychology (Kaplan and Haenlein, 2010; Sinharay, 2010). It encompasses a diverse set of mathematical models, including a path modelling statistical method to analyse interrelationships between variables in a model (Sarstedt, Ringle and Hair, 2014). Building on the research questions and hypotheses, using the path analysis statistical technique (e.g., CB-SEM), or the so called 'second generation of multivariate analysis' (Fornell, 1982) is more appropriate for this research.

Lowry and Gaskin (2014), among others (e.g., Hair *et al.*, 1995; Sarstedt, Ringle and Hair, 2014), argue that SEM offers scholars and practitioners more flexible, extensive casual modeling capabilities than the statistical techniques of regressions, correlations or difference of means tests (first-generation statistical techniques). In particular, SEM is superior to first-generation statistical techniques by (i) providing a holistic analysis of the model, including indirect and direct theoretical propositions; (ii) assessing theory and measurements that provide the analysis with discriminant validity (i.e., the constructs are distinct and the correlation between them is low (Hair *et al.*, 2010)) and convergent validity (i.e., how well the construct was measured by its items (Hair *et al.*, 2010; Costello and Osborne, 2016), in both the measurement and structural model (described in detail in chapter 5; Data Analysis and Results); and (iii) mitigating the risk of fixed-scale construction issues by accounting for all the indicators in the measures. Consequently, employing the SEM method is more suitable for this research in order to assess our theoretical propositions. The two forms of SEM, namely CB-SEM and partial least squares structural equation modeling (PLS-SEM), and the circumstances under which either is used, are discussed below, and a comparison between the two is shown in Table 4.2.

The CB-SEM method is popular in marketing research (Hair *et al.*, 2014) and aims mainly "*to confirm theories by determining how well a model can estimate a covariance matrix for the sample data*" (Hair *et al.*, 2014, p. 107). In essence, CB-SEM is appropriate for explanatory research design, as is the case in this research. On the other hand, the PLS-SEM method is based on the iterative approach, through which the explained variance of endogenous constructs is maximised (Fornell, 1982; Hair *et al.*, 2014), consequently making PLS-SEM valuable for exploratory research purposes and theory development (Gefen and Straub, 2005; Hair, Ringle and Sarstedt, 2011; Hair *et al.*, 2014). Moreover, as shown in Table 4.2, unlike PLS-SEM, CB-SEM (i) represents the constructs as factors (Chin and Todd, 1995); (ii) undermines PLS-SEM in terms of model validation (Chin, 1998); and (iii) allows the researcher to perform an overall 'fit' assessment of the model by making comparisons between observed and covariance matrices (Lowry and Gaskin, 2014).

The sample size is one of the key factors that affect several aspects of SEM (Hair *et al.*, 2014), such as statistical power, model fit and parameter estimates (Shah and Goldstein, 2006), and determines which SEM method is more suitable for conducting the analysis (Hair, Ringle and Sarstedt, 2011). The minimum sample size requirement is different for PLS-SEM and CB-SEM; for the CB model, the rule of thumb of 5 to 10 participants for each item is commonly used in for determining the sample size (Kline, 2011); however, typically CB-SEM requires a sample size larger than 200 observations (Hair, Ringle and Sarstedt, 2011).

On the other hand, Hair *et al.* (2014) emphasise that for the PLS model, the minimum sample size should be equal or greater of the, first, ten times the largest number of items used to measure one construct (i.e., formative indicators). For instance, if a survey has five constructs, and each construct has 6, 7, 5, 4, 5 items respectively, the sample size will be 10 * 7 (the number of items of the second construct being the largest) which equals 70 observations as the minimum sample size. Second, *"ten times the largest number of inner model paths directed at a particular construct in the inner model* (Barclay, Higgins and Thompson, 1995) " (Hair *et al.*, 2014, p. 109).

According to the discussion above, especially for complex models, PLS-SEM can be utilised with a much smaller sample size than CB-SEM (Hair *et al.*, 2014). In particular, PLS-SEM achieves a higher level of statistical power in the case of a small sample size than CB-SEM (Hair, Ringle and Sarstedt, 2011). However, using sample size as a criterion for choosing which SEM method to use is not free of debate and criticism (Chin and Newsted, 1999; Hair *et al.*, 2014).

The rule of thumb in determining the minimum requirement for the sample size, specifically for PLS-SEM, does not take into account the critical factors that affect the statistical power, such as reliability and size effects (Henseler, Ringle and Sinkovics, 2009). As a result, numerous scholars such as Barclay, Higgins and Thompson (1995), Chin and Newsted (1999), Goodhue, Lewis and Thompson (2007) and Marcoulides, Chin and Saunders (2009) argue that using sample size as a guideline to determine whether to use PLS-SEM or CB-SEM should be approached with caution. The criteria for choosing between PLS-SEM and CB-SEM are presented in Table 4.2.

Table 4.2: PLS-SEM versus CB-SEM.

Criterion	PLS-SEM	CB-SEM
Objective	Prediction-oriented	Parameter-oriented
Approach	Variance-based	Covariance-based
Assumptions	Predictor specification (nonparametric)	Typically, multivariate normal distribution and independent observations (parametric)
Abnormal distributions	Preferable (although it will still affect the results, but to lesser extent).	Should not be used: results in unreliable findings
Non-homogeneity of variance	Preferable (although it will still affect the results, but to lesser extent).	Should not be used: results in unreliable findings
Epistemic relationship between a latent variable and its measures	Can be modelled in either formative or reflective mode	Typically, only with reflective indicators
Implications	Optimal for prediction accuracy	Optimal for parameter accuracy
Model complexity	e.g., 100 constructs and 1000 indicators	Low to moderate complexity (less than 100 indicators)
Sample size	Power analysis based on the proportion of the model with the largest number of predictors. Observations→minimum 30	Observations (200-800) → unreliable for small sample size (often will not converge)
Includes interaction effects	Preferable, as it is designed for easy interaction	Difficult with small models, nearly impossible with large ones
Includes multiple-group moderators	Can use, but difficult	Preferable

Source: Adapted from Chin (1998), Lowry and Gaskin (2014) and Sarstedt, Ringle and Hair (2014).

Note: PLS-SEM = Partial least squares structural equation modelling; CB-SEM = Covariance-based structural equation modelling.

Among the modelling considerations presented in Table 4.2 that help the researcher to decided which SEM method to use, Hair *et al.* (2014), amongst others (e.g., Chin, 1998; Gefen and Straub, 2005; Lowry and Gaskin, 2014; Sarstedt, Ringle and Hair, 2014), assert that the research objectives are the crucial factor in considering whether to use PLS-SEM or CB-SEM. To emphasise, if the research objectives aim to develop or test a new theory (exploratory objectives), PLS-SEM should be considered. On the other hand, CB-SEM is more suitable if the research objectives aim to confirm theoretical propositions derived from a well-established theory. Our research aims and questions are explanatory in nature rather than exploratory, hence the use of CB-SEM is more appropriate.

According to Hair *et al.* (2010), EFA is the first step to be performed in CB-SEM in order to explore the factor structure. However, in order to perform EFA, the datasets should to some extent follow a normal distribution (Sarstedt, Ringle and Hair, 2014).This section explains the pre-analysis tests concerning the normality tests, followed by a discussion of EFA, and a presentation of the measures of reliability and validity after conducting EFA. Furthermore, this research follows the two-step approach to performing the latent variable CB-SEM using the ML algorithm, as suggested by Anderson and Gerbing (1988). This approach asserts that after conducting EFA, CFA should be performed by first examining the measurement model, and then testing the structural model.

4.5.1 Normality of datasets

Normality refers to the normal distribution of the data for a particular variable and can be assessed through skewness and kurtosis (Sposito, Hand and Skarpness, 1983). In social sciences, especially among marketing and management scholars, there is no agreement on what constitutes a slight, moderate or severe extent of non-normal distribution of the data, nor what values of skewness and kurtosis constitute 'acceptable' non-normality (for recent meta-analysis, see Niemand and Mai, 2018). Concerning skewness, Tabachnick and Fidell (2013) suggest that skewness values of between 1.5 and -1.5 are acceptable, while West, Finch and Curran (1995), Trochim and Donnelly (2006), Field (2000, 2009), George and Mallery (2010) and Gravetter and Wallnau (2014) recommend that a threshold of less than 2 and higher than -2 is acceptable.

Concerning kurtosis, since there is no agreement on its acceptable threshold to consider the distribution of the data as normal, Sposito, Hand and Skarpness (1983), suggest that it is not significantly different from that of normal distribution if the absolute value of the kurtosis is less than three times the standard error; otherwise, the data distribution has kurtosis issues. Several marketing scholars consider kurtosis values above 3.5 but less than 8 to be 'moderate' non-normality levels acceptable for CB-SEM (see Kline, 2015; Niemand and Mai, 2018), while others, such as West, Finch and Curran (1995), Byrne (2010) and Hair *et al.* (2010), suggest that the absolute value of kurtosis should be less than 7. Consequently, evidence of high kurtosis, i.e., higher than 7, according to West, Finch and Curran (1995), is one of the serious issues that might affect the quality of the CB-SEM analysis results. Specifically, cases of abnormal distributions of the data will result in unreliable findings (Chin, 1998; Sarstedt, Ringle and Hair, 2014).

4.5.2 Exploratory factor analysis (EFA)

With regard to factor analysis, Hurley *et al.* (1997) argue that deciding whether to perform EFA in order to determine that the items under each construct actually represent that theoretical construct or perform a CFA directly depends on the scales. In particular, Hurley *et al.* (1997) note that if the primary data were collected using scales with sufficient theoretical and empirical evidence, scales which have been widely used in the literature and empirically tested for reliability and validity, then the data can be taken directly to CFA without running EFA beforehand. Further, Finch and West (1997) and Fabrigar *et al.* (1999) argue that using EFA is more common amongst researchers when developing scales, as well as in the case of the lack of an a priori hypothesis about the construct. Although all the scales adapted in this study have theoretical support and empirical evidence, we opted to perform EFA before CFA for the following reasons. First, the scales for networking capability and firm innovativeness are well-established and widely used in the literature, while those for the DART model, although they have been validated and used in empirical studies, are relatively new and not yet widely used (see section 4.10).

Second, Henson and Roberts (2006), Worthington and Whittaker (2006) and Tabachnick and Fidell (2013) state that in cases of primary data, EFA is useful to (i) uncover the underlying structure of the constructs under investigation; (ii) identify the hidden relationships between the constructs; and (iii) detect and eliminate any 'noise' arising from sampling or measurement error. This section describes EFA in detail, including decisions on the extraction and rotation methods were employed to generate the pattern matrix and the measurement of sampling adequacy. The section also demonstrates how the datasets achieved reliability, and convergent and discriminant validity.

4.5.2.1 Extraction method

After data screening, we employed EFA using IBM SPSS statistics tool V. 25.0 in an attempt to determine the groups of constructs/factors related to our theoretical framework assumptions (Tabachnick and Fidell, 2013; Costello and Osborne, 2016). In cases of relatively normally distributed data, Costello and Osborne (2005), citing Fabrigar *et al.* (1999), argue that the use of ML algorithm is the most suitable extraction method when conducting EFA. They argue that ML *“allows for the computation of a wide range of indexes of the goodness of fit of the model [and] permits statistical significance testing of factor loadings and correlations among factors and the computation of confidence intervals. (p. 277)”* (Costello and Osborne, 2005, p. 2).

On the other hand, principal components analysis (PCA), as one of the principal factor methods, is more suitable in cases where *“the assumption of multivariate normality is severely* *violated"* (Costello and Osborne, 2005, p. 2). In addition, several scholars, such as Byrne (2010) and Kline (2015), argue that the ML algorithm is the most widely used extraction method when performing SEM. In fact, IBM AMOS uses the algorithm for CB-SEM; in essence, if researchers intend to use IBM AMOS to perform CFA and CB-SEM, then they should use the ML algorithm when performing EFA (Gaskin, 2020).

4.5.2.2 Rotation method

The next step after choosing the extraction method for EFA is to determine the rotation method. Although the rotation methods cannot improve the basic aspects of EFA, such as the amount of variance extracted from the items, they clarify and simplify the data structure (Brown, 2009; Costello and Osborne, 2016). According to Fabrigar *et al.* (1999) and Costello and Osborne (2005), there are two groups of rotation methods when conducting EFA: first, the orthogonal methods of rotation such as Varimax, Quartimax, and Equamax rotations; and second, the oblique methods of rotation such as direct Oblimin, Quartimin, and Promax.

Fabrigar *et al.* (1999) and Costello and Osborne (2005) assert that the oblique methods of rotation are more suitable for social sciences research. Oblique methods of rotation allow the produced factors to correlate and are suitable for relatively large datasets (i.e., above 150 observations), while the orthogonal methods produce uncorrelated factors (IBM Knoweldge Center, no date; Finch and West, 1997; Matsunaga, 2010). In fact, Costello and Osborne (2005) argue that *"using orthogonal rotation results in a loss of valuable information if the factors are correlated, and oblique rotation should theoretically render a more accurate, and perhaps more reproducible, solution"* (p.3). Therefore, following Costello and Osborne's recommendations, all 29 items were subjected to EFA using the ML extraction method, with Promax rotation kappa 4.

The reason behind using Promax rotation among other oblique rotations is as follows. Promax rotation begins with the orthogonal rotation of the factor matrix, specifically the Varimax rotation. This rotation then raises the item loadings to some power, called 'kappa', to produce an ideal hypothesised factor matrix (Hendrickson and White, 1964). Promax rotation transforms the orthogonal rotation to an oblique solution (Finch and West, 1997; Matsunaga, 2010). Specifically, *"signs of loadings are restored and the unrotated factor matrix is then rotated to the best least-squares fit to this ideal factor matrix"* (IBM Support, no date, para. 2). By doing so, Promax rotation brings the items that are theoretically related under one factor, and simultaneously correlates the factors with each other, producing a simple structure of the item loadings (i.e., the pattern matrix).

Matsunaga (2010), citing Comrey and Lee (1992), argues that *“in computation, the promax method operates to obtain the solution with the lowest possible kappa so that the resultant factors/components are maximally distinguishable”* (p. 101). Therefore, we used the default value of 4 for kappa, as set by IBM SPSS statistics tool V. 25.0, as IBM Support (no date) states that this value is recommended by kappa power *“developers Hendrickson and White (1964) as generally providing a good solution”* (para. 2).

4.5.2.3 Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett`s test of sphericity

As advised by Worthington and Whittaker (2006) and Tabachnick and Fidell (2013), we checked two criteria which are critical in determining if the data are adequate for analysis, and if the correlations between the constructs are equal to 0. The first criterion is the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. This measure tests if the sample size is adequate (appropriate) for factor analysis (Kaiser, 1974). Specifically, the KMO measure of sampling adequacy concerns the correlation matrix, and if it actually contains factors or not.

Field (2009) notes that the KMO measure of sampling adequacy represents the ratio of the squared correlation among the factors to the squared partial correlation. According to Kaisern (1974), the measure diverges between 0 and 1, with KMO > 0.9 considered to be superb; 90 > KMO > 80 excellent; 80 > KMO > 70 middling; 70 > KMO > 60 mediocre; 60 > KMO > 50 poor; and KMO < 50 unacceptable. The second criterion is Bartlett`s test of sphericity (Bartlett, 1950), which should be significant.

4.5.2.4 Tests of convergent validity, discriminant validity and reliability during EFA

Convergent validity assesses the degree to which the items/indicators (the question statements in the survey) of the construct are correlated with the underlying construct they measure (Hair *et al.*, 2010). In other words, it is an indication of how well the construct is measured by the questions, and an indicator that the constructs are distinct and uncorrelated. In order to obtain convergent validity, these items should be strongly correlated. According to Hair *et al.* (2010) and Kline (2015), it is achieved if first, the item loadings in the pattern matrix are higher than 0.5, as recommended by Comrey and Lee (1992); second, if the item loading values for the same construct are fairly close to each other; i.e., the narrower the range of item loading values, the greater the convergent validity established; and third, if the construct items are not strongly cross-loaded on other constructs (called factors in the pattern matrix).

The assumption here is that the constructs should relate more strongly to their own factor than to another factor in the pattern matrix (Hair *et al.*, 2010); we elaborate more on this point in a later paragraph in this section. If cross-loading issues do exist for a specific item, the difference between the item loading on the underlying construct should be greater than 75 per cent of its cross-loading on another construct (Ferguson and Cox, 1993). However, if the difference between the cross-loading is less than 0.2, the item should be excluded (Ferguson and Cox, 1993). Furthermore, Cronbach`s alpha (α) coefficient is another indicator of convergent validity when its value for each item is greater than 0.7 (Nunnally, 1978). Finally, convergent validity is achieved when the average variance extracted (AVE) (i.e., the amount of variance in the model explained by the construct) is equal to or greater than 0.5 (Fornell and Larcker, 1981). AVE values above 0.5 for the construct demonstrate that the variance accounted for the construct in the model is due to the construct items.

As previously mentioned, discriminant validity refers to the case when the constructs in the model are distinct and not highly correlated (i.e., a correlation value above 0.85 or -0.85 is deemed strong) with each other (Kline, 2010). Put differently, the construct items should relate to one factor in the pattern matrix; that is, the shared variance among the items for one construct should be greater than the shared variance with the other constructs, which indicates the distinctiveness of the construct among the others (Fornell and Larcker, 1981). The distinction among the constructs demonstrates that they indeed represent different theoretical concepts.

Discriminant validity is established when first, there are no strong cross-loadings following the same roles for convergent validity, as discussed above, and there are no strong correlation values in the correlation matrix during EFA (Ferguson and Cox, 1993; Kline, 2010); and second, when the value of the square root of AVE for the construct in the correlation matrix is greater than any correlation in the matrix (Fornell and Larcker, 1981),

4.5.3 Confirmatory factor analysis (CFA)

The next step in CB-SEM after performing EFA is to submit the measurement model obtained from the EFA analysis to CFA in order to assess its fit to the dataset used in CB-SEM (Schreiber *et al.*, 2006). According to Kline (2015), the measurement model submitted to CFA should be checked for composite reliability. Composite reliability, also known as the “rho coefficient” (Kline, 2015), is the ratio of the explained variance of the construct compared to the total shared variance of all the constructs. It is a measure of the internal consistency of the scale. For a construct to achieve composite reliability, its values should equal to 0.7 or above (Nunnally, 1978). The advantage composite reliability has over α coefficient is that it weighs each item`s contribution to the variance explained by the construct individually, while α coefficient assumes that all items contribute equally to the shared variance explained by the construct (Nunnally, 1978; Kline, 2015). Therefore, a high value (0.7 or above) of composite reliability is an indication of the scale`s internal consistency, and that each item does indeed measure the construct.

When reaching the CFA step during the data analysis, it is important to assess the goodness-of-fit and badness-of-fit indices, starting from CFA, up to the full structural model (Bollen, 1989; Bollen and Long, 1993; Kline, 2015). The following sub-section discusses in detail the goodness-of-fit and badness-of-fit indices.

4.5.3.1 Goodness-of-fit and badness-of-fit indices

Goodness-of-fit and badness-of-fit indices are labels used by scholars to group the fit indices depending on what value of the indices constitutes 'good' and what constitutes 'bad' (Kline, 2011; Niemand and Mai, 2018). In the goodness-of-fit indices, a value of 1 indicates a good model fit. This group contains a number of indices such as the goodness of fit index (GFI); the Tucker Lewis index (TLI) (also known as a non-normed fit index (NNFI) (Kenny, 2015; Wyse *et al.*, 2016)); the comparative fit index (CFI); and the incremental fit index (IFI) (Kline, 2011; Niemand and Mai, 2018). As for the badness-of-fit indices, a value of 0 indicates a good model fit; this group contains the root mean square error of approximation (RMSEA) and the standardised root mean residual (SRMR) (Niemand and Mai, 2018, p. 1149) (see description/definition of model fit/misfit indices used in the current research in Appendix 10).

According to Niemand and Mai (2018), the goodness-of-fit and badness-of-fit indices can be further divided into two groups: first, the absolute fit indices group, such as GFI, RMSEA and SRMR, which *"evaluate the degree to which the specified model reproduces the sample data"* (Wyse *et al.*, 2016, p. 861); and second, the incremental fit indices group, such as IFI, CFI and TLI. The incremental fit indices compare the proposed model with a baseline model (called the "worst case scenario" by Hu and Bentler (1998)), disregarding any factor loadings and correlations (Wyse *et al.*, 2016; Niemand and Mai, 2018).

Various model fit/misfit indices to assess the fitness of the measurement and structural models are used by marketing scholars when performing CB-SEM (Niemand and Mai, 2018). Since there is no specific set of model fit/misfit indices to draw on to assess for the fitness of the model, numerous scholars, such as Hu and Bentler (1998), Marsh, Hau and Wen (2004), Sharma *et al.* (2005), Kline (2015) and Niemand and Mai (2018), suggest that certain factors should be taken into consideration when choosing the appropriate model fit/misfit indices to assess model fitness. These factors include the sample size, model complexity, the normality/non-normality of the data, factor loadings, factor variances, the number of items (indicators), and the number of variables.

Despite the fact there is no universal agreement on which model fit/misfit indices should be used, Hu and Bentler (1998) suggest that during SEM researchers should use at least a combination of two model fit indices, one from the absolute indices group favouring the SRMR then the RMSEA, and the other from the incremental fit indices group such as CFI and TLI.

In addition to the GFI, CFI, TLI, IFI, RMSEA, and SRMR, one of the most common indicators traditionally used by scholars to assess model fit is the X^2 and the X^2 to the df ratio (X^2 /df) (Iacobucci, 2010; Kenny, 2015; Wyse *et al.*, 2016). Whilst the X^2 and X^2 /df are widely used in the literature to assess the fitness of models with a sample size of fewer than 200 participants, these indices are insufficient to give an accurate assessment of the model fit for a sample size of more than 200 participants, for two main reasons. First, X^2 and X^2 /df are highly sensitive to the sample size (Bagozzi and Yi, 1988; Kenny, 2015), and second, X^2 is *“affected by the size of the correlations in the model: the larger the correlations, the poorer the fit”* (Kenny, 2018, para. 7). Specifically, the X^2 and X^2 /df in a sample size of more than 200 participants are often statistically significant (Kenny, 2015), which not only limits their practical usefulness in assessing the model fit (Baumgartner and Homburg, 1996), but also increases the likelihood of generating Type II error, i.e., *“erroneously accepting a misspecified model”* (Niemand and Mai, 2018, p. 1149).

In essence, the use of the absolute fit indices and incremental fit indices groups is recommended by the scholars mentioned above, since they are less sensitive to sample size (Kline, 2011; Kenny, 2015; Wyse *et al.*, 2016). However, X^2 and X^2 /df should be reported during SEM analysis despite the issues associated with them, as first these indices are the bases for calculating two of the most widely used model fit indices by scholars, namely RMSEA and TLI (Bagozzi and Yi, 1988; Kenny, 2015), and second, X^2 is the only inferential statistic among the aforementioned model fit/misfit indices, where they exist only as rules-of-thumb (Iacobucci, 2010, p. 91).

4.5.3.2 Confirming CFA through cross-validation

In accordance with Cudeck and Browne (1983), Byrne (2010) and Kline (2010), we performed a second cross-validation test to measure invariance across groups in order to determine whether or not the measurement instrument (i.e., the scales) was functioning equivalently across different population samples. In other words, we tested if the items were functioning in the same way in terms of the measurement of their respective constructs. This is achieved if the cross-validation results yield invariance among the two groups (Browne and Cudeck, 1989). We split the datasets from both business networks randomly into two subgroups of fairly similar size from the same population, in line with Browne and Cudeck's (1989) recommendations.

In this test, three models were assessed against each other. In accordance with Byrne (2010), the first model was the hypothesised model from our research, which was unconstrained to zero. The second model was the saturated model, *“in which the number of estimated parameters equals the number of data points (i.e., variances and covariances of the observed variables, as in the case of the just-identified model), and is the least restricted”* (Byrne, 2010, p. 73) of the three models. The third model was the most restricted model of the three as it was constrained to zero (i.e., all the correlations among the constructs are zero). Therefore, this model is referred to as the independence model (null model), in which all constructs are completely independent.

The first step in assessing measurement invariance across groups, as suggested by Cudeck and Browne (1983), Byrne (2010) and Kline (2010), is to test for configural invariance. In this step, we are testing whether the same general specifications of the hypothesised model hold across groups as evidence of configural invariance. If we have a model with configural invariance, the first general specification should exhibit a good model fit within each individual group (Cheung and Rensvold, 2002; Kline, 2010); the items should relate to the same construct across both groups, while achieving acceptable levels of measurement model fit indices, as discussed in section 5.5.2.1. The next step is the testing of the invariance of the parameters estimates across groups in order to assess if the configural invariance holds (Browne and Cudeck, 1989).

Moreover, in single sample cross-validation, Browne and Cudeck (1989) recommend the expected cross-validation index (ECVI) as a central assessment measure for cross-validation. Specifically, Byrne (2010) argues that ECVI *“measures the discrepancy between the fitted covariance matrix in the analyzed sample, and the expected covariance matrix that would be obtained in another sample of equivalent size”* (p. 82). Unlike other model fit indices shown in Appendix 10, there is no cut-off criterion for ECVI, as it may take any value above zero (Browne and Cudeck, 1989). According to Byrne (2010), the model with the lowest ECVI value indicates the greatest potential for replications.

Finally, according to Steiger (1990), the value of ECVI is also an indication of other cross-validations checks. Steiger (1990) argues that ECVI values between the lower and upper limits of a 90 per cent confidence interval are an indication of (i) the independence of the observations; (ii) the efficiency in ML estimation during CB-SEM and as an extraction method during EFA; and (iii) the normality/ relative normality of data distribution.

As discussed in previous chapters (i.e., Chapter 1: Introduction and Chapter 2: Literature Review), the context of this research is business networks; therefore, it takes into account the moderation effect of network structure, especially network position (i.e., the location of actors in the business network), on the relationship between networking capability and access to resources. In order to map the business network and flow of resources, and to extract the network position constructs, it is necessary to perform SNA, which is discussed in the following section.

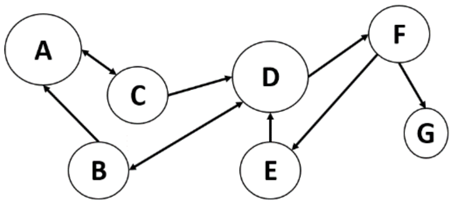
4.6 Social network analysis (SNA)

SNA is a methodology associated with social network theory and graph theory, used widely in the social sciences, such as in economics and marketing. Its focus is the relationships between social structure and the implications of these relationships (Wasserman and Faust, 1994; Borgatti and Halgin, 2011; Scott, 2017). According to Wasserman and Faust (1994, p. 3), ‘structure refers to the presence of regular patterns in relationships between social entities (actors)’; these actors are individuals and/or organisations known as nodes/vertices (Scott, 1988). They are connected with interdependencies (ties/links/relationships); the ties are called arcs if the direction of the relationship between two nodes is known and represented by lines with arrowheads.

Edges refer to the ties without directions (the direction of the relationship is unknown), and are represented by a line without an arrowhead (Wasserman and Faust, 1994), while central nodes (e.g., lead organisations), which connect multiple nodes together due to their bargaining power, are referred to as hubs (Håkansson, Havila and Pederson, 1999; Hinterhuber, 2002). Furthermore, the social network might contain several clusters; i.e., “*areas of the network where actors are more closely linked to each other than they are to the rest of the network*” (Tichy, Tushman and Fombrun, 1979, p. 509).

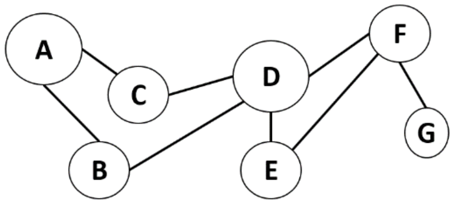
Grounded on graph theory (Bondy and Murty, 1976), the type of tie allows research to distinguish between two types of network, namely directed and undirected ones, which in turn influences which SNA metrics are to be used in order to analyse the network (Scott, 2017). Directed networks (Figure 4.1) refer to the networks in which the direction of the relationship between the actors is known (i.e., the order of the actors and the relationships is important) (Scott, 2017). In essence, the direction of the relationship indicates the flow of resources, such as knowledge, skills and information, among the actors (Wasserman and Faust, 1994). In contrast, an undirected network (Figure 4.2) refers to networks in which the direction of the relationships between the actors is unknown; consequently, the links between the actors only indicate the existence of the relationship (Wasserman and Faust, 1994).

Figure 4.1: Directed Network.



Source: Own elaboration.

Figure 4.2: Undirected Network.



Source: Own elaboration.

Calculating the network metrics (e.g., centrality measures) depends on the network type (directed or undirected); in particular, as our networks are directed, this research applies the metrics of centrality derived from established metrics in graph theory (Freeman, 1979; Wasserman and Faust, 1994). According to Wasserman and Faust (1994), an actor's centrality can be determined by several indicators, such as degree centrality and closeness centrality. These measures are discussed in the following sub-section from the perspective of social network theory and the value co-creation literature. It is worth noting here that there are several measures that can be used for SNA (see Borgatti and Everett, 1992; Wasserman and Faust, 1994; Scott, 2017 for more measures); however, we only discuss the ones related to our research questions and hypotheses.

4.6.1 Centrality measures

First, degree centrality refers to "*the count of the number of ties to other actors in the network*" (Klepac, Kopal and Mri, 2014, pp. 139–140). The measure denotes the existence of resources and knowledge flows. Degree centrality consists of two derivations, namely (i) in-degree, related to relationships directed towards the actor, and (ii) out-degree, the number of relationships directed away from the actor (Sparrowe *et al.*, 2001). In-degree allows the identification of which actors in the business network are attracting more resources from the network than others (Scott, 2017). It is a measure of potential influence or power/leadership and respective status (Freeman, 1979; Scott, 2017). A higher in-degree level indicates that a particular actor has more potential resources than those with a lower level (Wasserman and Faust, 1994). Further, higher in-degree indicates the potential of that actor to lead/connect other actors (with less in-degree) to other resourceful actors (Bandyopadhyay, Rao and Sinha, 2011).

Out-degree, on the other hand, indicates the degree (greater or lesser) of the influence of the actor in the business network, which indicates the extent of the actor's dependency (Wasserman and Faust, 1994). In other words, higher out-degree indicates that an actor is more dependent on other actors (with higher in-degree) in terms of seeking financial assistance, advice and problem solving (Scott, 2017). Therefore, higher out-degree denotes two things: first, it indicates the expensiveness of that actor (e.g., the actor requires more resources than other actors do) in the business network. Second, it indicates the capacity of the actor to offer resources for other actors (Bandyopadhyay, Rao and Sinha, 2011).

Second, closeness centrality refers to the actor's proximity to other actors; higher closeness gives the actor a higher power of reference (Klepac, Kopal and Mri, 2014). Further, higher closeness strengthens the ability of the actor to engage in a direct dialogue, have direct access to resources, and enjoy higher power of influence (Bandyopadhyay, Rao and Sinha, 2011). Donato *et al.* (2017) posit that higher closeness leads to more business indications, which therefore result in value co-creation.

The type of centrality measure used in SNA is determined by the purpose and objectives of the analysis (Tichy, Tushman and Fombrun, 1979; Wasserman and Faust, 1994). As aforementioned, this study investigates the impact of networking capability on the value co-creation process, specifically on access to resources, as such networking capability denotes an actor's ability to build, develop and utilise relationships with others in business network (Walter, Auer and Ritter, 2006). Degree centrality and closeness centrality measures are more suitable for this research. In particular, one derivation of degree centrality, i.e., in-degree centrality, is employed, "*as Freeman (1979) argued, in-degree centrality is the most suitable centrality measure for capturing an individual actor's information or knowledge access*" (Tsai, 2001, p. 1000). In addition, Sparrowe *et al.* (2001) argue that in-degree centrality for each actor is not self-reported, i.e., reported by the other actors, *"and it thus does not suffer from the limitations of self-reports, as does out-degree centrality"* (Sparrowe *et al.*, 2001, p. 320). Further, in investigating the network position, the use of degree centrality and closeness centrality measures is common in the marketing literature (e.g., Swaminathan and Moorman, 2009; Laud *et al.*, 2015; Mani and Luo, 2015; Thornton, Henneberg and Naudé, 2015; Muller and Peres, 2019). The formulas for degree centrality and closeness centrality are presented in Appendix 11. The following section discusses the sampling procedures proposed by Freeman (1979), Borgatti and Everett (1992) and Wasserman and Faust (1994) when conducting SNA, as well as the different network modes that affect the sampling procedures.

4.6.2 Sampling in SNA, network modes and network boundaries

According to Wasserman and Faust (1994), the nature of the study determines whether a sample of actors can be surveyed, or whether the whole business network should be taken into account. Further, scholars such as Freeman (1979), Borgatti and Everett (1992) and Wasserman and Faust (1994) argue that the nature of the network variables (i.e., structural and composition variables) determines which sampling technique and analytical method are more appropriate for SNA. For instance, structural variables are concerned with the measurement of a specific kind of tie (e.g., friendship, transactions, innovation, information flows), while composition variables are at the individual level, concerned with the measurement of actors' attributes such as profit, gender, ethnicity, geographical location and number of employees (Scott, 2017).

This research is concerned with the structural variables, specifically the innovation ties between the actors in the business network. In this regard, Wasserman and Faust (1994, p. 92) use the term 'mode' *"to refer to a distinct set of entities on which the structural variables are measured*". They further argue that networks can be categorised into three types, depending on the set from which the actors come. First, the one-mode network is the most common type of network in SNA (Wasserman and Faust, 1994; Scott, 2000), in which all the actors come from one set (e.g., the same business network). Second, a two-mode network indicates that the actors come from two different networks, but that these are connected through ties between some actors (e.g., studying the financial resources flow between a network consists of profit organisations, and a network consists of non-profit organisations). Finally, a higher-mode network refers to a network in which the actors come from more than two sets of networks, one of which has ties with one or more sets.

Each case study in this research consists of a one-mode network, in which the actors come from the same business network and participate in the digital engagement platform. Although the two business networks were selected according to our selection criteria (see section 4.9), it is crucial to determine the boundaries of the set of actors in each business network. In fact, SNA scholars such as Laumann, Marsden and Prensky (1983), Wasserman and Faust (1994), Scott (2000), Borgatti, Brass and Halgin (2014) and Snow and Fjeldstad (2015) argue that although actors can be in a closed actor set (e.g., employees in an organisation, or faculty in an academic department), the issues such as determining which of them are in the research population, and who are the relevant actors in a given study, are relatively easier to determine compared to networks with broader boundaries (e.g., business networks). In fact, Wasserman and Faust (1994, p. 31) argue that "*the boundary of the set of actors may be difficult (if not impossible) to determine*", as such making an 'external' (i.e., by the researcher) definition of actors' set boundary a common practice in network research in order to enable the researcher to determine which actors belong to the network.

In essence, Laumann, Marsden and Prensky (1983, 1989) emphasise two approaches to setting boundary specifications in SNA studies, namely realist and nominalist. First, the realist approach assumes that there is a 'true network' (Borgatti and Halgin, 2011) of relationships among sets of actors, and that the actor set boundaries are perceived by the actors themselves (Wasserman and Faust, 1994). However, it is the researcher`s job to discover and elicit these networks (Borgatti and Halgin, 2011). Second, concerning the nominalist approach, Borgatti and Halgin (2011) argue that it is more sophisticated than the realist approach in defining the actors' set boundaries, as it is based on the theoretical and practical concerns of the research (Wasserman and Faust, 1994). In effect, the type of network generated is determined by the research question (Borgatti and Halgin, 2011). This research follows the nominalist approach in order to set boundaries for the business networks by asking the participants to define the actors who they have innovation ties with. This makes the networks formed by SNA questions in our survey innovation networks. These are collaborative networks formed by multiple actors (within and outside the organisation), aimed at improving the effectiveness of innovation performance and contributing towards the creation and development of new processes and value propositions (Corsaro *et al.*, 2012; Kodama, 2015).

It is mentioned that in several applications it is difficult or even not possible to take measurements from all the actors in the defined business network (Wasserman and Faust, 1994), especially when the actor boundaries are unknown (Borgatti, Brass and Halgin, 2014). In that case, Wasserman and Faust (1994) propose the use of special sampling techniques in order to make inferences about the research population, such as snowball sampling. In the snowball sampling technique (Goodman, 1961), the research sample consists of several zones: first, the researcher asks a group of actors (referred to as the first-order zone) to defined others with whom they have ties; the actors nominated by the first-zone actors then define another set of actors with whom they have ties (referred to the second-order zone) and who are not included in the first-order zone, and so on. However, Wasserman and Faust (1994) posit that "*most network studies focus on well-defined, completely enumerated sets, rather than on samples of actors from larger populations*" (p. 33). In other words, prior to data collection, researchers assume that they can obtain information relevant to the theoretical concerns from all the substantively important actors that form the network (Wasserman and Faust, 1994). However, some actors might be omitted from the actor set unintentionally, or due to certain theoretical or practical concerns; therefore, the size of the actor set depends on both theoretical and practical concerns (Wasserman and Faust, 1994; Scott, 2000). In this light, the basis for determining the unit of analysis and the related accuracy, validity, reliability and measurement error issues related to SNA are discussed in the following sections.

4.6.3 Unit of analysis and business network modelling unit

This research contains two types of data, first SNA data from which the network position variables are extracted, and standard social and behavioural science data, i.e., the remaining constructs in the theoretical framework. According to Wasserman and Faust (1994), these two types of data differ from each other in a number of important ways, the most important being that SNA data are composed of one or more relations measured amongst a set of actors. In effect, the presence of the relationships has implications for SNA measurement issues, including the unit of observation and the level at which the network data are studied (Wasserman and Faust, 1994).

In SNA studies, the unit of observation is an entity from which the researcher takes the measurements; it can be an actor, a pair of actors, a relational tie, or an event (Wasserman and Faust, 1994). Wasserman and Faust also argue that since the information concerning the ties between the actors are often elicited through asking them to define with whom they have ties; the unit of observation is an actor. Depending on the context of the research, the 'units' are sometimes referred to as respondents, cases or subjects, and often the unit of observation is the unit of analysis (Weinstein, 2010). Further, Babbie (2016, p. 102) states that "*the unit of analysis is an important element in research design, and later, in data analysis*". Therefore, it is important here to clarify the meaning of 'unit of observation' and 'unit of analysis' (Weinstein, 2010; Babbie, 2016).

Weinstein (2010) and Babbie (1992, 2016) posit that the unit of observation is the unit (actor) from whom the data are collected, while the unit of analysis is the 'what' or 'who' being studied; i.e., the unit (actor) assumed to have the characteristic(s) identified in the research hypotheses (e.g., individuals, groups, organisations, social interactions and social artefacts). In this regard, Babbie (2016) points out that the organisation can be the unit of analysis when the research implies a population of all organisations; in essence, each individual organisation might be characterised in terms of different attributes such as net annual profits and number of employees. The researcher then gathers these organisational characteristics through a representative of the organisation; i.e., the unit of observation (Wasserman and Faust, 1994; Babbie, 2016).

Wasserman and Faust (1994) label the level at which network data are studied as the 'modelling unit'; these levels are the actors, dyads, triads, subgroups and sets of actors (network). Further, the modelling units in network research are referred to as 'analytical levels' or ‘levels of analysis’ in social and behavioural science and classified at micro, meso and macro levels (Lavrakas, 2008). Wasserman and Furst (1994) emphasise that it is useful to consider the level at which a network property applies, in order to categorise the network methods. For instance, according to Wasserman and Faust (1994), if the researcher wants to study a ‘friendship network’, some of this network’s properties (i.e., the ‘choice’ of a friend in this example) concerns the individual actor; that is, the number of times (choices) the actor was nominated by others as a friend. At the dyad level, the network property pertains to a pair of actors (e.g., if actor A chooses actor B as a friend, does actor B choose actor A in return?). The example of the dyad level also applies to the triad level, i.e., three actors. As such, studying the network property among all the actors in the network positions the modelling unit at the network level.

Building on the discussion above, in this research the unit of analysis in SNA is the actor (organisation), with a representative of each actor, i.e., the chief marketing officer (CMO) or someone in an equivalent position, is the unit of observation. Further, taking the nominalist approach by asking the actors to identify other actors they have ties with means the modelling unit is the network. As such, the unit of analysis and unit of observation of the SNA phase are consistent with the corresponding units for the remaining theoretical model constructs when all the constructs are at firm-level.

The issues of accuracy, validity, reliability and measurement error associated with the unit of analysis in SNA, and how this research dealt with these issues, are discussed in the following section.

4.6.4 Accuracy, validity, reliability and error of the SNA measures

This section discusses the issues of accuracy, validity, reliability and error (noise) associated with SNA measurement, together with the procedures and solutions to address each of them. However, the issues pertaining to the remaining theoretical model constructs, i.e., networking capability, the DART model and firm innovativeness, are addressed in the following chapter (i.e., Chapter 5: Data Analysis and Results). The reason for this separation is that the researcher needs to take into account these issues when choosing the data collection tool and design in order to address reliability and validity issues in network studies. These issues are discussed below.

4.6.4.1 Accuracy of the SNA measures

According to Galaskiewicz (1985), the issue of accuracy in business network studies depends mainly on the unit of observation. Specifically, Galaskiewicz (1985) and Wasserman and Faust (1994) point out the issue of information accuracy when the unit of analysis is the organisation, and the unit of observation is a representative of it. They argue that in order to obtain accurate data about the unit of analysis, the individual from whom the researcher is collecting the data in fact has knowledge of the information being sought. Following the recommendations of Babbie (1992, 2016), Wasserman and Faust (1994) and Weinstein (2010) (see section 4.6.3), the unit of analysis in this research is the organisation, while the unit of observation is one employee (i.e., someone in an executive role or a corporate officer such as a CMO) as it is assumed that they have the required knowledge of the theoretical framework constructs, meaning that accurate data about the unit of analysis would be obtained. The following section discusses the validity of the SNA measures.

4.6.4.2 The validity of the SNA measures

Validity is the extent to which the measurement of a concept or construct actually measures what it is intended to measure (Carmines and Zeller, 1979). Although validity concerns are seldom discussed in SNA (Wasserman and Faust, 1994; Scott, 2017), this study clarifies two types of validity concerns with SNA measures, namely, face validity and construct validity.

Face validity refers to how well questions/items cover the concept/construct they purport to measure (Holden, 2010). In SNA, researchers assume that the measurements of a network property/concept are indeed valid (Mouton, Blake and Fruchter, 1955b; Wasserman and Faust, 1994). On the other hand, Wasserman and Faust (1994) argue that construct validity is a more formal notion of validity, and refers to the state in which the measures of the construct/concept are behaving, as expected in theoretical predictions (Creswell *et al.*, 2003; Neuman, 2013). The construct validity of SNA measures can be studied by examining how these constructs behave according to theoretical propositions (Mouton, Blake and Fruchter, 1955b; Wasserman and Faust, 1994).

To ensure face validity in SNA, this research follows Wasserman and Faust's (1994) recommendation to ask participants about particular types of ties. Specifically, when in this research actors were asked about others with whom they interacted about innovative ideas, the face validity of the question was assumed as a measure of innovation ties between the actors, in the sense that the answer to the question provides a set of actors with whom the respondents connect through innovation ties. In relation to construct validity, the construct validity of the SNA measures is assessed when testing the moderation effect in the following chapter (Data Analysis and Results).

4.6.4.3 Reliability and measurement error of the SNA measures

Reliability refers to the consistency of a measure (Carmines and Zeller, 1979). The construct is deemed to be reliable if repeated measures provide the same estimates of it every time (Neuman, 2013). In social and behavioural science, measurement reliability can be assessed by comparing the measurements across items i.e., internal consistency, over two points in time i.e., test-retest reliability, or by comparing the measurements across different researchers i.e., inter-rater reliability (Carmines and Zeller, 1979).

Wasserman and Faust (1994) argue that these reliability assessment approaches assume that the value of the construct/concept has not changed over time; however, this assumption is inappropriate for SNA measures, and using the aforementioned approaches in SNA is problematic, "*since social phenomena cannot be assumed to remain in stasis over any but the shortest spans of time*" (Wasserman and Faust, 1994, p. 58). As a result, the reliability of SNA measures can be assessed using different approaches, such as a comparison of alternative question formats (Conrath, Higgins and Mcclean, 1983), or by establishing measurement reliability by avoiding fixed-choice question design; for instance, by asking the actors to report a fixed number of names (e.g., 'mention three names') (Mouton, Blake and Fruchter, 1955a).

Measurement error, also known as 'observational error', is the difference between the 'true' value/score of a construct/concept and the measured (observed) value of it (Dodge, 2006). In SNA, the data collected from the actors by asking them about the ties between them represents the observed value, which may differ from the true structure of the network, which represents the true value of the measure (Holland and Leinhardt, 1973). Since there are several levels at which to study networks, for example, the modelling level, Holland and Leinhardt (1973) and Wasserman and Faust (1994) argue that it is important to understand the implications of measurement errors at the modelling unit levels. In this regard, Holland and Leinhardt (1973) assert that measurement error in SNA arises in particular in the use of fixed-choice data collection designs, with which the participants (actors) are restricted to a mentioned fixed number of names with whom they have ties. However, the participants may have fewer names than what the question is asking for, or even more names that may be of more importance. As such, fixed-choice data collection designs introduce measurement error, as it is unlikely that all the actors have exactly the same fixed number of ties as requested in that type of question (Holland and Leinhardt, 1973; Wasserman and Faust, 1994).

Building on the discussion above, this research employs a full rank ordered question (e.g., Please identify up to 10 people who are important to you in your business network by mentioning their company's name) in order to address the issues of reliability and measurement error.

4.6.5 Business network visualisation and network metrics

This section discusses the SNA metrics that were used to analyse the FMCG and hospitality business networks maps. The research employed two algorithms to visualise the business network maps, namely the ForceAtlas2 and Fruchterman Reingold algorithms. ForceAtlas2 is an algorithm used in Gephi to visualise the network map using forced-directed drawing based on the attraction and repulsion proportional to the distance between nodes. It therefore depends on the connection between nodes (Jacomy, 2011; Jacomy *et al.*, 2014). The Fruchterman Reingold algorithm allows for force-directed graph drawing, in which the length of edges is ignored, resulting in a clearer structure that exhibits symmetries, allowing better visualisation (Kobourov, 2012). We also employed the modularity measure in order to create network clusters (communities), as recommended by Jacomy *et al.* (2014). Modularity is an unbiased measure of collective proximity of the nodes, based on the fact that *"actors have more relations inside their community than outside, and communities are groups with denser relations"* (Jacomy *et al.*, 2014, p. 2).

The forced-directed drawing technique employed by the ForceAtlas2 algorithm visualises the density of the cluster structure, so enhancing the visual interpretation of the network (Jacomy *et al.*, 2014). Newman (2003) refers to the density of a cluster as *"community structure, i.e., groups of vertices that have a high density of edges within them, with a lower density of edges between groups"* (p.17). However, we cannot make a more comprehensive comparison of the network topology between two business networks by visualisation only. In fact, in order to compare the changes in a directed business network over time or to compare two different directed networks, Hansen, Shneiderman and Smith (2011) and Hosseini and Kesler (2013) recommend the use of overall network metrics, including (i) network diameter, (ii) descriptive statistics (e.g., average degree), and (iii) small-world parameters, especially the average path length and the average clustering coefficient, in which the *"clustering coefficient of a node is a measure of the number of edges that exist between its nearest neighbours"* (Hosseini and Kesler, 2013, p. 7).

Wasserman and Faust (1994) define the network diameter as the largest geodesic distance between the connected actors; it presents how many steps it takes for an actor to cross from one side of the network to the other (i.e., the size of the network). The network diameter suggests how rapidly the information is likely to reach all the actors in the connected network; the lower the network diameter, the quicker the information travels and reaches every actor (Wasserman and Faust, 1994). In addition, Watts and Strogatz (1998) and Borgatti, Brass and Halgin (2014) define the average path length as the shortest distance between two actors.

The small-world index (small-worldness) according to Watts and Strogatz (1998) and Borgatti, Brass and Halgin (2014) indicates that any two actors can reach each other through a short sequence of acquaintances (Kleinberg, 2001), referred to as 'Six Degrees of Separation' by Milgram (1967). The small-world index is calculated according to Equation 4.1.

Equation 4.1: Small-world index.

$$\boldsymbol{SWI = \frac{L - L_l}{L_r - L_l} * \frac{C - C_r}{C_l - C_r}}$$

Source: Telesford *et al.* (2011)

where:

$\boldsymbol{SWI}$	=	Small-world index.
$\boldsymbol{L}$	=	Path length for the network under study.
$\boldsymbol{L_l}$	=	Path length for an equivalent lattice network.
$\boldsymbol{L_r}$	=	Path length for an equivalent random network.
$\boldsymbol{C}$	=	Clustering coefficient for the network under study (see Equation 4.2).
$\boldsymbol{C_r}$	=	Clustering coefficient for an equivalent random network.
$\boldsymbol{C_l}$	=	Clustering coefficient for an equivalent lattice network.

Note that the clustering coefficient for a network (global clustering coefficient), often referred to as 'transitivity' (Wasserman and Faust, 1994), provides an indication of the clustering in the whole network. It assumes that all the actors in the networks are in triadic relationships. Put differently, *"the triad involving actors i, j, and k is transitive if whenever i → j and j → k then i → k"* (Wasserman and Faust, 1994, p. 243). Ostroumova Prokhorenkova (2017) refers to the case where the three pairs (*i*, *j*),(*j*, *k*) and (*i*, *k*) are a 'closed triplet', while the 'open triplet' is formed by any two of these three pairs. Wasserman and Faust (1994) refer to the open triplet as 'vacuously transitive'. Building on the above, the clustering coefficient for the network (global clustering coefficient) is defined as:

Equation 4.2: Clustering coefficient for the network.

$$\boldsymbol{C = \frac{total\ value\ of\ closed\ triplets}{total\ value\ of\ triplets}}$$

Source: Opsahl and Panzarasa (2009) and Ostroumova Prokhorenkova (2017)

where:

$\boldsymbol{C}$	=	Clustering coefficient for the network under study.
$\boldsymbol{total\ value\ of\ triplets}$	=	The sum of the closed and open triplets.

The clustering coefficient as a local measure for each actor shows how dense (concentrated) the cluster is where the actor is located (Zelinka and Chen, 2018). As an overall (global) measure, the average clustering coefficient represents the tendency of actors to create tightly connected clusters (Zelinka and Chen, 2018).

The small-world network is characterised by a small average path length and high average (global) clustering coefficient. The large number of clusters, coupled with the low average path length, allows the information and resources to be integrated and transmitted more quickly in small-world networks than in regular lattice networks due to the shortcuts (random connections) between the actors (Ichinose *et al.*, 2018; Muller and Peres, 2019).

The connectedness, i.e. the connection redundancy in a network (Borgatti, 2003), and fragmentation, the proportion of pairs of actors that cannot reach each other in the network (the unreachable nodes, an inverse measure of the level of connectedness) (Zelinka and Chen, 2018) were also calculated using the UCINET 6.0 software package. Connectedness and fragmentation are overall (global) network measures that denote the cohesion of the network and how well the actors are connected within it. Borgatti (2003) and Hanneman and Riddle (2005) posit that the measures of connectedness and fragmentation can be used to evaluate the cohesiveness of the network, as well as to facilitate understanding of how information is transmitted within it, and which actors are more likely to impede the transmission of information to all the actors in the network. A connectedness of 1 indicates that all the actors in the network are still reachable if any actor is removed from it (i.e., the network is connected to a single component) (Zelinka and Chen, 2018). In essence, a fragmentation value higher than 0 indicates that there are a proportion of actors that cannot be reached by the other actors if some of them are eliminated from the network (Hanneman and Riddle, 2005). In this situation, a higher level of connectedness (thus lower fragmentation and higher cohesion) results in less ambiguity about authority and dominant interactions in the network (Borgatti, 2003; Hanneman and Riddle, 2005).

The data required for SEM and SNA were collected through an online-based survey (see section 4.4). Borgatti and Halgin (2011) and Sande and Ghosh (2018) argue that survey-based empirical research and SNA might be associated with endogeneity and CMB, which could contaminate the analysis results and lead to misinterpretation. Therefore, this research took into account any anticipated bias and followed the appropriate procedures to address the problem, as discussed in the following sections.

4.7 Endogeneity in survey-based research

The endogeneity issue in survey-based empirical research, and the procedures to correct for it, have received a great deal of attention from marketing scholars, especially in topics such as marketing strategy, international marketing, and inter-organisational relationships (Hult *et al.*, 2018; Sande and Ghosh, 2018; Rutz and Watson IV, 2019). The increased interest in endogeneity stems in the fact that it will generate biased results that "*can cause researchers to arrive at flawed conclusions and to offer poor advice to practitioners*" (Sande and Ghosh, 2018, p. 185). Although the endogeneity issue is probably always present in survey-based research (Liu, Otter and Allenby, 2007; Ebbes, Papies and van Heerde, 2016), it is crucial to go beyond only uncovering the source of endogeneity into addressing the endogeneity issue (Zaefarian, Kadile, *et al.*, 2017). Therefore, the literature provides several approaches (techniques/remedies) to enable the researcher to accurately and consistently measure the phenomenon of interest.

Similarly, Borgatti and Halgin (2011), in their study of business network structures from the social network theory perspective, and how these impact actors' performance, raised the following question: "*If actors deliberately shape the networks around them for their benefit, can it really be said that it was network structure that led to the benefit?*" (p.1177). Borgatti and Halgin also argue that if the research cannot predict how factor X (e.g., network position) leads to factor Y (e.g., performance) without knowing how factor X came about, or predict other contextual factors that might interact with factor X (e.g., skills, capabilities, and motivations) to bring about outcome factor Y, then it is evident that the research theory that X leads to Y is incomplete.

The following sub-sections discuss the factors that cause the issue of endogeneity in marketing and social network research, the procedures to deal with endogeneity, and how this research addresses and deals with endogeneity issues.

4.7.1 Endogeneity in SEM

In marketing research applications, the endogeneity problem occurs in regression models when the researcher uses observational data (i.e., survey data or non-experimental data) to investigate causality between the 'independent' variables, or explanatory/exogenous variables, on the 'dependant' variable(s) or the outcome(s) (Ebbes, Papies and van Heerde, 2016; Rutz and Watson IV, 2019). In this regard, marketing scholars such as Liu, Otter and Allenby (2007), Jean *et al.* (2016), Sande and Ghosh (2018) and Rutz and Watson IV (2019) have identified two primary conditions/sources of endogeneity bias in marketing research, namely omission of variable(s) and measurement errors.

4.7.1.1 Omitted variables bias

Omitted variable bias refers to the case when the researcher's omission of explanatory variables might affect both the outcome/dependent variable Y/(DV) and the exploratory/independent variable X/(IV), thereby leading to a correlation between X and Y in the proposed model (Wooldridge, 2002). The omitted variable is not only the most common source for endogeneity bias in survey-based research, but is also the most difficult source of endogeneity to diagnose (Liu, Otter and Allenby, 2007; Rutz and Watson IV, 2019). Such difficulty lies in the uncertainty pertaining to the omission of such exploratory factors. In the case of omitted variable bias, Rutz and Watson IV (2019) suggest several procedures to address this in marketing research, such as the control function/variable and the latent instrumental variable.

First, the use of control variables, referred to as the 'rich data model' (Germann, Ebbes and Grewal, 2015) is an appropriate approach to addressing endogeneity (Sande and Ghosh, 2018). Sande and Ghosh argue that although the rich data model suggests that all the expected control variables should be 'perfectly measured' and included in the regression model, in survey-data empirical research this condition is unfeasible. Regardless of this limitation, control variables are widely used in survey-based research and can still play an important role in ensuring the exogeneity of the exploratory variables (Sande and Ghosh, 2018, p. 191). In addition, Wooldridge (2015), Papies, Ebbes and Van Heerde (2017) and Rutz and Watson IV (2019) argue that the control variable approach to addressing omitted variable endogeneity is well suited when the outcome variable is non-continuous (e.g., firm innovativeness in this research), as well as if an interaction effect exists (e.g., the moderation effect of network position in this research).

Bernerth *et al.* (2018) among others (e.g., Carlson and Wu, 2012; Becker *et al.*, 2016), state that having several controls is not necessarily better; instead, they suggest that *"less is more when it comes to statistical control"* (p.154). That is, the inclusion of control variables should have a theoretical justification and/or empirical support, and *"less of the nontheoretical type is more"* (Bernerth *et al.*, 2018, p. 154). Consequently, this research employs a number of control variables in order to control for possible omitted variable bias. Specifically, consistent with previous studies (e.g., Katila and Ahuja, 2002; Akgün *et al.*, 2007; Rhee, Park and Lee, 2010; Ngo and O'Cass, 2012), our model includes firm-specific control variables, namely firm size, and firm age, as well as industry type (e.g., goods manufacturers and service providers) to consider possible differences across industries (e.g., Boso *et al.*, 2013; Cui and Wu, 2016). We discuss these control variables and the theoretical reasoning for choosing them in detail in section 4.10.5.

The second procedure is the latent instrumental variable. In this, the latent instrumental variable (e.g., networking capability) affects the explanatory variable (e.g., the DART model components), which in turn affects the outcome variable (e.g., firm innovativeness). The latent instrumental variable is one of the most commonly used methods to address endogeneity issues in survey-based research (Reiersöl, 1945; Sande and Ghosh, 2018). Rossi (2014) argues that the use of the ML algorithm when performing CB-SEM in itself addresses endogeneity, as this sequence of variables/constructs in the model can be estimated simultaneously. We elaborate further on this argument below.

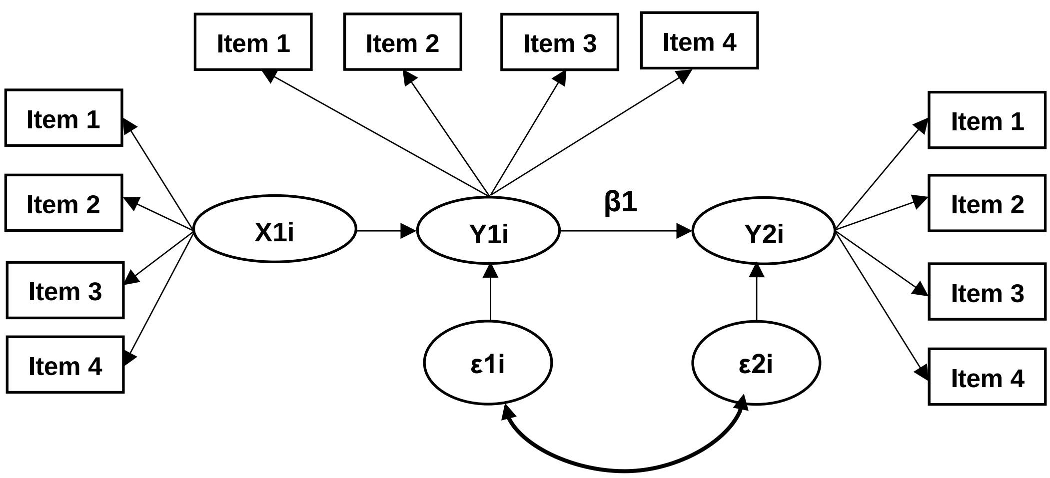
In marketing research, it is common to use a multi-item scale in survey-based research (Sande and Ghosh, 2018). These items (the survey questions) are referred to as observed/manifested variables in SEM, and can be categorical or continuous variables, typically indicated by squares (see Figure 4.3) in the visual model in SEM (Kline, 2015). On the other hand, the term latent variable denotes two categories: first, the ‘factor’; a hypothetical construct or *“explanatory entities presumed to reflect a continuum that is not directly observable”* (Kline, 2015, p. 12). As shown in Figure 4.3, the observed variables (the items) are used as indicators which indirectly measure the construct, *“and the statistical realization of a construct based on analyzing scores from its indicators is a factor”* (Kline, 2015, p. 12). Second, the latent (unobserved) variable refers to the error terms or residuals associated with the observed variables (i.e., items) or with the factors specified as outcomes (endogenous variables) (Chin, 1998; Byrne, 2010; Kline, 2015).

It is worth noting that SEM defines endogenous variables slightly differently from the common definition, which refers to the outcome variable, usually called the DV (Sande and Ghosh, 2018). In SEM, Byrne (2010) and Kline (2015) acknowledge that the outcomes/DVs are referred to as endogenous variables, with endogenous meaning ‘from within’ the model. Each endogenous variable has at least one cause; this can be another endogenous variable or an IV. When the cause of the endogenous variable is an IV, this is referred to as an ‘exogenous variable’ in SEM. In this case, exogenous means ‘from without’ the model; as such, what caused the IV is not a concern for the model. In other words, the outcome variables are called endogenous variables rather than DVs in SEM due to the fact that they can act as a cause (i.e., act as explanatory variables) in any equation and effect (i.e., as an outcome) in another equation at the same time and in any part of the model (Gunzler *et al.*, 2013). In effect, endogenous variables in SEM refer to any variables that are determined within the model (Bollen, 1989; Sande and Ghosh, 2018).

In relation to the omitted variables, the explanatory factor (exogenous) might correlate with the error terms of a specific model (see Figure 4.3), showing inconsistency in the estimates (Rutz and Watson IV, 2019). The inconsistency in coefficient estimates which occurs as the explanatory factor might be driven by factor(s) unobserved (unaccounted for) by the researcher (Hult *et al.*, 2018). In effect, the assumption that explanatory variables are exogenous is not viable, as this might contaminate the results and the outcome variables may be biased (Chintagunta, 2001; Jean *et al.*, 2016).

Muthén and Jöreskog (1983), as cited by Sande and Ghosh (2018), suggest how CB-SEM can correct for endogeneity using instrumental variables. First, as shown in Figure 4.3, the latent instrumental variable (X1i) should be significantly associated with an endogenous latent variable (Y1i). Second, the effects of the latent instrumental variable (X1i) on the endogenous latent variable (Y2i) should be completely mediated by the endogenous latent variable (Y1i). Finally, the latent instrumental variable (X1i) should be uncorrelated with the error terms (ε 1i and ε 2i) of the endogenous latent variables. Note that Figure 4.3 illustrates another endogeneity issue besides the omitted variables; i.e., the correlation between ε 1i and ε 2i, which CB-SEM accounts for. Put differently, applying Figure 4.3 to this study, if the theoretical framework did not include X1i (networking capability) when examining the impact of Y1i (the DART model) on Y2i (firm innovativeness), the results of the data analysis would suffer from endogeneity bias. This endogeneity issue is mitigated by introducing networking capability into the model. In addition, the use of CB-SEM for data analysis in this research allows us to ensure that ε 1i and ε 2i are uncorrelated in order to avoid contaminating the results.

Figure 4.3: Measurement model. An illustration of the instrumental variable approach and latent explanatory variables in SEM.



Note: Y1i and Y2i= endogenous latent variables; X1i= exogenous latent variable; ε= error term; β= beta coefficient.

Source: Own elaboration

To this end, CB-SEM is a unique technique used to address endogeneity bias due to its ability to analyse both observed and latent variables (Byrne, 2010; Kline, 2015). In particular, the covariance between the error terms is explicitly estimated as part of the model in CB-SEM using ML, meaning the researcher not only controls for the omitted variable, but also other sources of endogeneity (Sande and Ghosh, 2018). In fact, Sande and Ghosh posit that the researcher can address endogeneity issues using CB-SEM by considering the modification indices (a Lagrange multiplier test), and the Chi-square difference test ($\Delta\ \chi^2$ test) of ML estimation (i.e., likelihood ratio test), similar to CMB, also known as the common method variance (CMV) test. This research employs all these techniques during the data analysis, as described in Chapter 5 (Data Analysis and Results). CMB and the ex-ante and ex-post remedies to address it are discussed later in this chapter. In the meanwhile, the following sub-section discusses the second cause of endogeneity in SEM, measurement error bias.

4.7.1.2 Measurement error bias

Measurement error bias (or error-in variable) refers to the case when the constructs (explanatory or outcome) are imperfectly or inconsistently measured, causing difficulty in estimating their true value, and subsequent difficulty in precisely estimating the relationship between them (Wooldridge, 2002; Kennedy, 2008). In fact, unbiased recovery occurs if the explanatory variable is measurement-error free, but the DV has a measurement error, due to the fact that *“measurement error in the dependent variables leads to an increase in the variance of the error term (i.e., residual error)”* (Rutz and Watson IV, 2019, p. 484). However, measurement error bias in the explanatory variables reduces the parameter estimates in the structural model; i.e., attenuation bias (Wooldridge, 2002; Sande and Ghosh, 2018). Indeed, to avoid contaminating the analysis results with measurement error bias, the researcher should have the ability to accurately and consistently measure the phenomenon of interest.

Clearly, measurement error bias occurs if the explanatory variable has a measurement error; for instance, because of the CMB (as discussed in section 4.8) (Wooldridge, 2002; Sande and Ghosh, 2018). For this reason, measurement bias needs to be addressed in this case (Rutz and Watson IV, 2019). In this regard, Kennedy (2008) acknowledges several factors that cause measurement error bias in survey-based research, such as (i) missing data in the dataset; (ii) non-reliable constructs; (iii) errors in translating the research question; and (iv) the items are poorly related to the research context. The remedies to address these factors are the same as those to deal with CMB; therefore, we discuss them together in section 4.8. The following section discusses in detail the endogeneity bias associated with SNA.

4.7.2 Endogeneity in SNA

Endogeneity issues in business network studies are mainly focused on the effects of network structure/attributes on the outcome variables, specifically on firm performance (Stuart and Sorenson, 2007). This section briefly discusses the issue of endogeneity in SNA research, giving two examples from the literature; first, the entrepreneurial context and second, the networking capability context.

In the entrepreneurial context, Stuart and Sorenson (2007) posit that entrepreneurial opportunities arise from the uneven distribution of information in the business network. The concept of 'entrepreneurial opportunities' is in line with one of the basic tenets of SNA (Stuart and Sorenson, 2007): actors vary in their access to information in the business network due to the different positions they occupy in it (Tsai, 2001; Swaminathan and Moorman, 2009). "*The general argument, then, is that opportunity recognition involves access to private information, and that social networks, as the conduits of information flow, have a large influence on who knows what—and when they know it*" (Stuart and Sorenson, 2007, p. 213). Although numerous studies have attempted to address the influence of network structure on opportunity discovery, Stuart and Sorenson (2007) argue that little has been done beyond examining the influence of cohesion and brokerage, leaving other components of network structure (e.g., centrality measures) unobserved (i.e., potential omitted variables).

Similar to Stuart and Sorenson (2007), Borgatti and Halgin (2011) acknowledge the endogeneity issues associated with the influence of network structure on outcomes, especially firm performance. Taking the social network theory perspective, Borgatti and Halgin (2011) argue that building ties (i.e., inter-organisational relationships) with other actors in business networks is associated with access to more novel information and resources, which may, in turn, lead to performance gains. In this regard, Borgatti and Halgin (2011) argue that if the researcher hypothesises that the explanatory factor (e.g., access to information) leads to the outcome (firm innovativeness in the research), the issue of endogeneity can be addressed if the researcher knows where the explanatory factor originated (building relationships in the example above, and networking capability in this research).

Further, as noted in section 2.5.3, taking the concept of the social capital approach (Coleman, 1988; Nahapiet and Ghoshal, 1998) in social networks (i.e., ties and network position associated with gains and positive outcomes), Borgatti and Halgin (2011) indicate that making the following reasoning is inevitable: "*if occupying a certain position in the network is rewarding, we can expect actors to take steps to achieve that position.*" (p.1178). In other words, actors create their business networks strategically to achieve desired outcomes such as NPD and firm performance (Mu and Di Benedetto, 2012). In effect, the network structure is an endogenous variable rather than exogenous one, estimating the effect of network structure on firm performance without addressing the issue that actors' agency in creating the business network will yield endogeneity bias (Borgatti and Halgin, 2011; Mu and Di Benedetto, 2012).

Overall, this research addresses endogeneity bias in several ways. First, all the constructs are measured using validated and reliable multi-item scales as in previous studies. Second, the research employs the control variable method to correct for any potential omitted variable bias. Third, it takes into account the effect of networking capability (i.e., an exogenous variable) as a firm-specific factor that influences the value co-creation process (Mostafa, 2016), which in turn influences firm innovativeness. Fourth, the research considers the endogenous nature of business networks (Stuart and Sorenson, 2007; Borgatti and Halgin, 2011) by estimating the moderating effect of network position on the relationship between networking capability and access, as one of the DART model components. Fifth, as mentioned in section 4.6.1, the research uses in-degree centrality as a derivation of degree centrality in order to avoid the self-reported bias associated with out-degree centrality (Sparrowe *et al.*, 2001). Finally, it employs the instrumental variable technique and the latent variable CB-SEM using the ML algorithm in IBM AMOS 25 in order to address CMB and other potential endogeneity issues. The following section discusses CMB and the remedies employed to control for it in this research.

4.8 Common method bias (CMB)

CMB is the "*variance that is attributable to the measurement method rather than to the constructs the measurement represents*" (Podsakoff *et al.*, 2003, p. 879). In other words, the bias concern is related to the dataset due to an issue external to the measures, such as the general context, scale type, or the content of specific items (Fiske, 1982; Podsakoff *et al.*, 2003). In fact, Podsakoff *et al.* (2003), MacKenzie and Podsakoff (2012) and Eichhorn (2014) acknowledge several sources of CMB in marketing research, such as (i) collecting data for IVs and DVs using a single (common) method/source; (ii) the survey instrument's design complexity and ambiguity; (iii) the respondents' ability to understand the questions; (iv) the length of the survey instrument; and (v) the item's context, i.e., its position within the sequence of questions. Understanding the sources of CMB is crucial to determining the appropriate ex-ante and ex-post remedies to address it (MacKenzie and Podsakoff, 2012). This research controlled for CMB using several of the ex-ante remedies recommended by Podsakoff *et al.* (2003) and MacKenzie and Podsakoff (2012). Specifically, the research:

1. Anonymised the respondents.
2. Randomised the question orders.
3. Included a marker question (attention trap).

4. Assured the respondents that there were no right or wrong answers.
5. Avoided double-barrelled questions.
6. Used established scales.
7. Maintained the scale anchor (e.g., five-point Likert scale).
8. Pre-tested the survey instrument with academics and practitioners.
9. Explained the procedures to the participants.
10. Identified the respondents to be in a CMO or equivalent position.

In addition,

11. The online survey included the University of Kent logo to create a positive image and assert the credibility of the research being conducted for academic purposes.
12. The online-based survey included a progress bar indicator to show the participants how close they were to completion (as recommended by Manfreda and Vehovar (2008)).
13. The cover letter clarified that ethical approval had been granted by the Kent Business School Ethics Committee (see section 4.10), and the researcher`s contact details were provided in case the participants wanted to request the ethical approval number or required more information and clarifications.

Besides the ex-ante remedies, the current research controlled for CMB by employing the common latent factor (CLF) technique, including the social desirability variable as recommended by Podsakoff *et al.* (2003) and MacKenzie and Podsakoff (2012), using CB-SEM in IBM AMOS 25. The justification for using the CLF technique instead of other approaches available for researchers is as follows.

The ex-post remedies are statistical techniques to control for CMB empirically after collecting the data, such as Harman`s single-factor test, the marker variable technique, and the CLF (Podsakoff *et al.*, 2003; Sharma, Yetton and Crawford, 2009; MacKenzie and Podsakoff, 2012). First, Harman`s single-factor test requires the application of EFA to all the measures, and assumes that CMB presents if the majority of the variance can be explained (accounted for) by a single factor (Podsakoff *et al.*, 2003). Harman's single-factor test can also be conducted with CFA as a more sophisticated technique (Podsakoff *et al.*, 2003). Podsakoff *et al.* argue that even though Harman`s single-factor test is widely used in the literature, it is only an indication of the presence of CMB, and does not actually statistically correct for any bias. In fact, Podsakoff *et al*. recommend against the use of this test for CMB, as the emergence of multiple factors during EFA does not indicate the absence of CMB.

Second, the marker variable technique. Lindell and Whitney (2001) suggest the use of a marker variable in order to control for CMB. This is used in CFA as *“a measure of the assumed source of the method variance as a covariate in the statistical analysis”* (Podsakoff *et al.*, 2003, p. 889). In other words, when including a marker variable in the model, the researcher expects that it will not correlate with the rest of the observed or latent variables in the model (Lindell and Whitney, 2001; Sheth, Sharma and Iyer, 2009). As such, the correlation between marker variables and any of the other variables is interpreted as an estimate of CMB (Sheth, Sharma and Iyer, 2009). However, Podsakoff *et al.* (2003) acknowledge that the use of a marker variable is associated with conceptual and empirical problems. For instance, one of such conceptual problems is that *“this procedure fails to control for some of the most powerful causes of common method biases (e.g., implicit theories, consistency motif, social desirability)”* (p.893).

Concerning empirical problems, Podsakoff *et al.* (2003) point out three critical problems associated with the marker variable technique: (i) the expectation that CMB can only inflate, not deflate the relationship between the explanatory variable/IV and the outcome variable/DV; (ii) ignoring the error terms in the model; and (iii) the assumption *“that common method factors do not interact with traits”* (p.893). In fact, there are additional conceptual and empirical problems associated with marker variable techniques (see Sharma, Yetton and Crawford, 2007; Straub and Burton-Jones, 2007; Richardson, Simmering and Sturman, 2009) that make the validity of the research findings using the marker variable technique questionable (Sharma, Yetton and Crawford, 2009). In addition, similar to Harman`s single-factor test, the marker variable technique is considered as a weak, conceptually flawed statistical control procedure for CMB (MacKenzie and Podsakoff, 2012, p. 544).

The third empirical technique is CLF, also known as the unmeasured latent method factor (Podsakoff *et al.*, 2003), in which the researcher introduces a new latent variable (i.e., CLF) to the CFA model on SEM in order to capture the common variance among all the observed variables (i.e., the items). The use of the CLF technique allows the item to load on both CLF and their theoretical constructs (Podsakoff *et al.*, 2003), where the paths between the items and CLF are considered to be equal, and the variance of CLF is considered to be 1 (i.e., an unconstrained model) (Eichhorn, 2014). The researcher then constrains the paths between the items and CLF (i.e., the variance of CLF is considered zero) and subsequently performs a $\Delta\ \chi^2$ test between the unconstrained model and the fully constrained one, in which all the model paths are constrained to zero (Podsakoff *et al.*, 2003). The results will show CMB to be an insignificant issue if it less than the threshold of 50 per cent (Eichhorn, 2014).

The reasons which justify the employment of a survey instrument in the research rather than other data collection techniques, as well as the components of the survey instrument, are discussed in the following section.

4.9 Survey instrument

There are a variety of ways in which SEM and SNA data can be gathered, using techniques such as interviews, surveys, questionnaires, experiments, observations and archival records (Wasserman and Faust, 1994). This research employed the survey instrument for the following reasons. First, surveys are the most common data collection technique in SEM and SNA studies. Specific to SNA, Wasserman and Faust (1994) argue that employing a survey is preferable when the actor is an organisation and the information regarding ties is reported by individuals representing that organisation. Second, surveys allow the researcher to collect information on a broad range of constructs and a large amount of data in a relatively short period of time (Creswell, 2003). Third, they are less expensive than other data collection techniques such as interviews, and can be created and administrated in a quick and easy way (Walsh and Wingens, 2003). Finally, in this research, (i) the theoretical framework consists of SNA constructs and other constructs derived from the literature review; (ii) the actors in the selected business networks are distributed in different countries; and (iii) typically, the minimum sample size for conducting CB-SEM according to Hair, Ringle and Sarstedt (2011) is 200 observations. Thus, the survey instrument is more suitable for this research.

The survey consists of seven parts (see Appendix 9); the first part is a cover letter including a brief introduction to the research title, the research purpose, and a guarantee of the confidentiality and anonymity of the respondents, followed by securing the participants' consent and agreement to take part in the study. The third part comprises seven questions concerning firmographic data (e.g., firm size, firm age and location). The fourth part is concerned with SNA and consists of two questions, while the fifth part covers the DART model (value co-creation process) and contains twenty-one questions. The sixth part comprises nine questions; five capturing networking capability, three capturing innovativeness, and one marker question as an attention trap. Finally, the seventh part concerns self-efficacy as an observed latent variable to include in testing for CMB, and contains five questions. The measurement scales are presented in the following section, while how the research dealt with the ethical issues is discussed in section 4.10.

4.10 Measures

This section presents the measurement scales for the constructs in the theoretical framework derived from the literature review. The definitions, items, scales and equations (where applicable) are provided in Appendix 11.

4.10.1 Firm innovativeness

We measured firm innovativeness using Hughes and Morgan's (2007) three-item scale. Innovativeness was measured using a five-point Likert scale which ranged from 'strongly disagree' (1) to 'strongly agree' (5).

4.10.2 Networking capability

We measured networking capability using Zhang et al.'s (2015) five-item scale. The networking capability was measured using a five-point Likert scale that ranged from 'strongly disagree' (1) to 'strongly agree' (5).

4.10.3 DART

We measured DART using Taghizadeh *et al.*'s (2016) four-component scale. The dialogue was assessed by six items, whilst the remaining components, namely access, risk and transparency, were each assessed by five items. The constructs were measured using a five-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5).

4.10.4 Centrality measures

In the survey (Appendix 9), two items captured the required data to form the edge and node lists required to perform the SNA for the innovation network. Note that although the relationships are directed, we refer to them as edges rather than arcs, in order to be consistent with the terminology used in the Gephi 0.9.2 and UCINET 6.0 software packages and to be able to use them for the analysis. After SNA, in-degree and closeness centrality were treated as constructs in the SEM in order to test our moderation hypothesis (see Klein, Ahlf and Sharma, 2015; Xue *et al.*, 2018).

4.10.5 Control variables

As mentioned in section 4.7.1.1, this research employs three firm-specific control variables, namely firm size, firm age and industry type. The theoretical reasons for choosing these specific variables are as follows.

Ettlie and Rubenstein (1987) argue that although numerous studies have acknowledged the influence of firm size on innovativeness, the direction and nature of the causal influence is *"not* *a topic of widespread agreement in the research literature"* (p. 89). Boso *et al.* (2013), citing Lau and Bruton (2011), argue that researchers can limit the potential influence of economies and diseconomies of scale on innovativeness and firm performance by controlling for firm size. For instance, Bell (2005) and Rodrigo-Alarcón *et al.* (2017) found a positive impact of firm size on innovativeness. In contrast, Jiao, Baird and Harrison (2019) found a negative impact. In this regard, Chandy and Tellis (2000), among others (e.g., Hsieh and Hsieh, 2015; Cui and Wu, 2016), argue that larger firms have more resources than SMEs to create innovative practices. Other scholars (e.g., Jiao, Baird and Harrison, 2020) argue that larger firm size increases firms' structural complexity, which in turn might negatively influence innovativeness.

Concerning firm age, numerous scholars such as Bell (2005), Phelps (2010), Cui and O`Connor (2012) and Cui and Wu (2016) posit that *"older firms tend to be less innovative due to organizational inertia"* (Cui and Wu, 2016, p. 527). In other words, older firms tend to exploit existing competences and opportunities rather than exploiting new competences and innovation opportunities. As such, Bell (2005), Phelps (2010) and Cui and Wu (2016) argue that there is a significant negative influence of firm age on innovativeness. Similarly, Bell (2005) and Jiao, Baird and Harrison (2019) found a negative influence of firm age on innovativeness. Finally, Rhee, Park and Lee (2010), Stanko, Bohlmann and Molina-Castillo (2013), and Rodrigo-Alarcón *et al.* (2017) found a non-significant effect of firm size and firm age on innovativeness.

To this end, consistent with previous research (e.g., Menguc and Auh, 2006; Akgün *et al.*, 2007; Rhee, Park and Lee, 2010; Stanko, Bohlmann and Molina-Castillo, 2013; Jiao, Baird and Harrison, 2020), we measured firm size through the number of full-time employees, while firm age was measured as the difference between the year of collection of the information, 2019, and the year the firm was founded (see Appendix 9). In addition, since our research context is business networks, which include a mix of goods manufacturers and service providers, we included industry type as a control variable (e.g., Boso *et al.*, 2013; Cui and Wu, 2016; Jiao, Baird and Harrison, 2020). We asked the participants about their core offerings, whether tangible goods or services, and measured industry type with a dummy variable; e.g., 1= manufacturers of tangible goods, and 0= otherwise (Boso *et al.*, 2013).

This chapter presented in detail the research methodology followed in this study to answer the research questions and achieve the research aims. The following chapter is Chapter 5 (Data Analysis and Results), which presents the data analysis and SEM and SNA results. It contains a clear explanation of how the research dealt with all the methodological issues discussed in this chapter, together with a comprehensive presentation of the results of the data analysis to answer the research questions.

Chapter 5. Data Analysis and Results

In order to achieve our research aim, in Chapter 3 (Theoretical Framework and Research Hypotheses) we developed four main hypotheses to test our theoretical framework. Next, Chapter 4 (Research Methodology) described in detail the research methodologies employed to answer the research questions and consequently achieve the study aims. Based on the marketing, strategic management, and network literature, a web-based survey using the Qualtrics platform was compiled and distributed, taking into account ex-ante remedies to control for CMB and endogeneity bias, as recommended by scholars such as Podsakoff *et al.* (2003) and Rutz and Watson IV (2019), in order to collect the primary data (see sections 4.7 and 4.8).

This chapter aims to describe and analyse the datasets, as well as to present the results of the hypothesis testing in terms of direct and moderation effects. The chapter begins with descriptive statistics of the firmographic data, in order to provide a comprehensive view of the participants. This is followed by presentation of the results of the testing for non-response bias. The chapter proceeds with discussion of the first phase of SNA to extract the centrality measures concerning in-degree and closeness centrality required to examine the moderation hypotheses. This is followed by presentation of the second phase of SNA to triangulate the results of CB-SEM in the following chapter (Discussion), providing greater clarity on how the architecture of the two networks would affect the value co-creation process. After extracting in-degree and closeness centrality, the CB-SEM analysis is considered. CB-SEM begins with data diagnostics for the case outliers, normality analysis, EFA and CFA and CMB, and discusses the several types of reliability and validity required to perform the measurement model analysis. Subsequently, following the recommendations of Kline (2010) and Lowry and Gaskin (2014), the multivariate assumptions are tested; i.e., the variance inflation factor (VIF), Pearson correlation, and Cook`s distance, as prerequisites for the path analysis. The chapter ends by testing the direct and moderation effect hypotheses.

5.1 Firmographic and participant characteristics

In section 4.4, we discussed the data screening and preparation procedures undertaken before the data analysis. To recap, we activated the ‘force response’ option offered by the Qualtrics platform in order to minimise the possibility of missing data by reminding the participants if they had missed any question in order to obtain complete responses. We screened the data using MS Excel to identify any missing values or multiple responses from the same participant by searching for company name duplications. After the data screening processing and the elimination of incomplete response, as referred to in section 4.10, the datasets were now complete, with 331 responses for the FMCG and 319 for the hospitality business networks, and ready for further analysis. The description of the datasets and descriptive statistics of the firmographic data are as follows.

In our web-based survey (Appendix 9), the third part comprises questions concerning firmographic data (i.e., industry type, firm size, firm age, the department where the respondent works, and their job level). As shown in Table 5.1, in the FMCG business network, the majority of the organisations are manufacturers (93.4 per cent), while 5.4 per cent are service providers; 41.7 per cent have 250 employees or more. The majority of the organisations (94 per cent) had been operating for 11 years or more. The majority of respondents worked in the marketing department (62.8 per cent), followed by 9.1 per cent in the operations department. Senior (higher) management such as corporate officers formed 97.3 per cent of the respondents, with 2.1 per cent at the owner/executive level, and 0.6 per cent at the intermediate level.

In the hospitality business network, as shown in Table 5.1, the majority of organisations are service providers (99.4 per cent), while 0.6 per cent are manufacturers. 47.6 per cent has 10 to 49 employees. The majority of the organisations (76.5 per cent) had been operating for 11 years or more. Almost half the respondents (50.5 per cent) worked in the marketing department of their organisation, followed by 27.3 per cent in the operations department. The majority of the respondents were corporate officers (95.9 per cent), while 4.1 per cent were at the owner/executive level.

Table 5.1: Firmographic and participant characteristics.

Variable	Level	FMCG (n = 331)	Hospitality (n = 319)
		***n* (%)**	***n* (%)**
Industry	Products (i.e., Goods)	309(93.4)	2(0.6)
	Services	18(5.4)	317(99.4)
	Products and services	4(1.2)	___
Firm size	Fewer than 10 employees	4(1.2)	44(13.8)
	10 to 49 employees	62(18.7)	152(47.6)
	50 to 249 employees	127(38.4)	88(27.6)
	250 employees or more	138(41.7)	35(11)
Firm age	Less than 3 years	___	1(0.3)
	3 years or more, but less than 5 years	1(0.3)	7(2.2)
	5 years or more, but less than 7 years	___	16(5)
	7 years or more, but less than 9 years	4(1.2)	21(6.6)
	9 years or more, but less than 11 years	15(4.5)	30(9.4)
	11 years and more	311(94)	244(76.5)

Table continues

Table 5.1 (Continued) Variable	Level	FMCG (n = 331) *n* (%)	Hospitality (n = 319) *n* (%)
Department	Production	27(8.2)	___
	Research and Development (R&D)	25(7.6)	___
	Purchasing	22(6.6)	7(2.2)
	Marketing (including functions such as selling and client account manager)	208(62.8)	161(50.5)
	Human Resources (HR)	3(0.9)	2(0.6)
	Accounting	6(1.8)	1(0.3)
	Finance	3(0.9)	2(0.6)
	Operations	30(9.1)	87(27.3)
	Quality assurance	___	33(10.3)
	Information Technology (IT)	4(1.2)	25(7.8)
	Logistics	3(0.9)	1(0.3)
Position (Job-level)	Owner/Executive	7(2.1)	13(4.1)
	Senior (higher) management (corporate officer, e.g., CMO, CFO…etc.)	322(97.3	306(95.9)
	Middle management	___	___
	Intermediate	2(0.6)	___
	Entry level	___	___

Note: CMO= Chief Marketing Officer; CFO= Chief Financial Officer.

The following section discusses the non-response bias test performed on the datasets of the FMCG and hospitality business networks.

5.2 Non-response bias test

As the data were collected over three months, two reminders were sent during the period, but we only received additional responses after the first reminder, with none after the second (see section 4.4), we conducted a non-response bias test. In our datasets, we divided the data into two waves (groups) according to the date of response, i.e., before or after the reminder. Respondents who completed the survey early (before the reminder) were coded 0, while those who completed the survey after the reminders were coded 1. For the FMCG business network, the first wave consisted of 248 participants, which formed 75 per cent of the total responses, while the second wave consisted of 83 participants, forming 25 per cent of the total responses (n = 331). For the hospitality business network, the first wave consisted of 258 participants, which formed 81 per cent of the total responses, while the second wave consisted of 61 participants, which formed 19 per cent of the total responses (n = 319).

In order to statistically check for non-response bias, using IBM SPSS statistics tool V. 25.0 we performed Levene`s test (Levene, 1960) for homoscedasticity (also known as the homogeneity of variance test). The test is a one-way analysis of variance for two groups, in which insignificant *p*-values (i.e., greater than 0.05) indicate that the variance between the two groups is not different (the variances are equal) (Bryman and Cramer, 2004). As shown in Tables 5.2 and 5.3, the test of homogeneity of variances for both datasets (FMCG and hospitality business networks) was insignificant, as evidenced by all the *p*-values being greater than 0.05. In essence, our data were not affected by non-response bias, although they were collected in two waves.

Table 5.2: Test of homogeneity of variances – FMCG business network (n = 331).

	Levene Statistic	df1	df2	Sig. (*p*-value)
NC	1.433	1	317	.232
D	.676	1	317	.412
A	.292	1	317	.589
R	.129	1	317	.720
T	1.987	1	317	.160
INNS	.687	1	317	.408

Note: df = degrees of freedom; Sig = Significance; Significance of *p*-value: * $p < 0.050$; NC =Networking capability; D = Dialogue; A = Access; R = Risk/benefit assessment; T = Transparency; *p*-value: 0.05.

Table 5.3: Test of homogeneity of variances – Hospitality business network (n = 319).

	Levene Statistic	df1	df2	Sig. (*p*-value)
NC	.951	1	317	.330
D	.067	1	317	.796
A	.059	1	317	.808
R	.028	1	317	.868
T	1.227	1	317	.269
INNS	.644	1	317	.423

Note: df = degrees of freedom; Sig = Significance; Significance of *p*-value: * $p < 0.050$; NC =Networking capability; D = Dialogue; A = Access; R = Risk/benefit assessment; T = Transparency.

The following section discusses the SNA procedures necessary to extract the centrality measures, namely the in-degree centrality and closeness centrality required to test our moderation hypotheses. It is necessary to undertake this step before performing CB-SEM, as explained in the following section.

5.3 SNA procedures – Extracting centrality measures

In order to perform a full CB-SEM that includes both the direct and indirect effects, we first have to extract the centrality measures, namely in-degree and closeness centrality, to be treated as constructs in the structural model during the CB-SEM required for testing the moderation effect. To do this, we pooled the SNA-related questions (Table 5.4) from the survey (Appendix 9) and processed them using MS Excel. Another reason for doing this was to create a business network map by identifying and recording the ties between the participants. We elaborate more on the network map for FMCG and hospitality networks in the following section.

In MS Excel, the company names were replaced with alphanumerical codes to ensure the anonymity of the respondents. For instance, company one (Actor 1) was coded as A1, company 2 was coded A2, and so on. After giving alphanumerical codes to the company names, we created two MS Excel documents, namely 'nodes' and 'edges', in order to tabulate the SNA data and analyse them using the Gephi 0.9.2 software package.

As previously mentioned in Chapter 4 (research methodology), it is important in this study to identify the source and target of resources flow, because the business network is directed; that is, the direction of the relationship between the actors is known i.e., the order of the actors and the relationships is important (Wasserman and Faust, 1994), as the type of the network (directed or undirected) influences which SNA metrics should be used to analyse the network (Scott, 2017).

In essence, the MS Excel document 'nodes' contained the respondents` ID and the given alphanumerical codes as labels, while the document 'edges' contained two columns representing the direction of the relationship between every two nodes, i.e., source and target. The column labelled as 'source' denoted the origin of the tie, while that labelled 'target' denoted the destination of the tie. For instance, respondent A1 mentioned ten names in question 6, i.e., Q6 (A2, A3 … A11), while answering the following question (Q7) regarding innovation ties: Whom are you likely to turn to in order to discuss a new or innovative idea? The respondent chose three people (A2, A4, and A9) from the ten mentioned in Q6; in this case, therefore, actors A2, A4, and A9 are the source, while A1 is the target.

Table 5.4: SNA questions.

<table>
<tr><td>Q6</td><td colspan="12">Please identify up to 10 people (from outside your company) who are important to you in your business network (by mentioning the name of the company they work for.)</td></tr>
<tr><td colspan="3" rowspan="2">For Q7, please tick ✓ as you find appropriate

Note: Names mentioned by the participants →</td><td>Person 1</td><td>Person 2</td><td>Person 3</td><td>Person 4</td><td>Person 5</td><td>Person 6</td><td>Person 7</td><td>Person 8</td><td>Person 9</td><td>Person 10</td></tr>
<tr><td>….</td><td>….</td><td>….</td><td>….</td><td>….</td><td>….</td><td>….</td><td>….</td><td>….</td><td>…..</td></tr>
<tr><td rowspan="2">Q7</td><td rowspan="2">Innovation ties</td><td>Whom are you likely to turn to in order to discuss a new or innovative idea?</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Who is likely to turn to you in order to discuss a new or innovative idea?</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

We imported the resulting matrices into the Gephi 0.9.2 software package to calculate centrality measures and in-degree and closeness centrality based on the formulas shown in Appendix 11. These measures were then imported into IBM SPSS statistics tool V. 25.0 to be treated as constructs in the CB-SEM analysis. The moderation effects of the centrality measures are discussed later in this chapter. In the meantime, to further understand the results of CB-SEM in general, and the moderation analysis in particular, we conducted further SNA beyond the mere extraction of in-degree and closeness centrality, to include the generation of both network attributes, as discussed in the following section.

5.4 SNA of FMCG and hospitality business networks

We employed Gephi 0.9.2 to visualise the business network maps (Figures 5.1 and 5.2) using the 'ForceAtlas 2' algorithm (Jacomy *et al.*, 2014). The network attributes of each business network (FMCG and hospitality) are presented in Table 5.5. We reran the hospitality business network in Gephi 0.9.2 using the Fruchterman Reingold algorithm instead of ForceAtlas2, as shown in Figure 5.3, for clearer visualisation of some of the hub positions between the clusters.

Figure 5.1: FMCG business network.

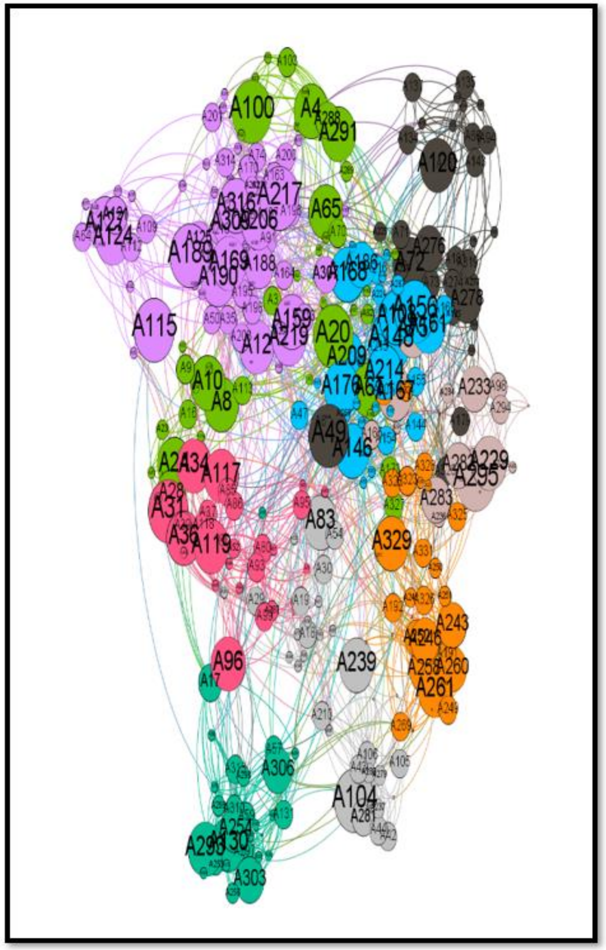
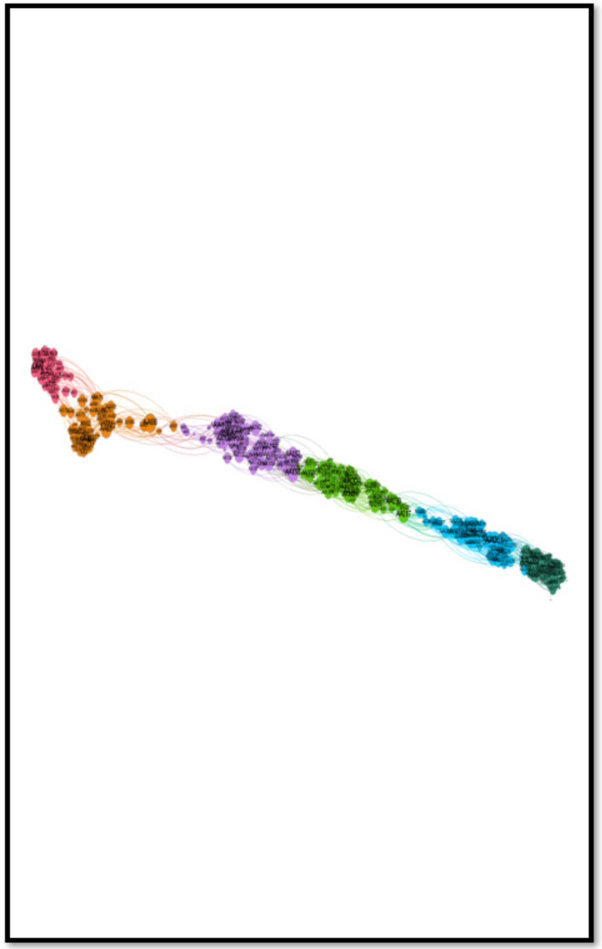
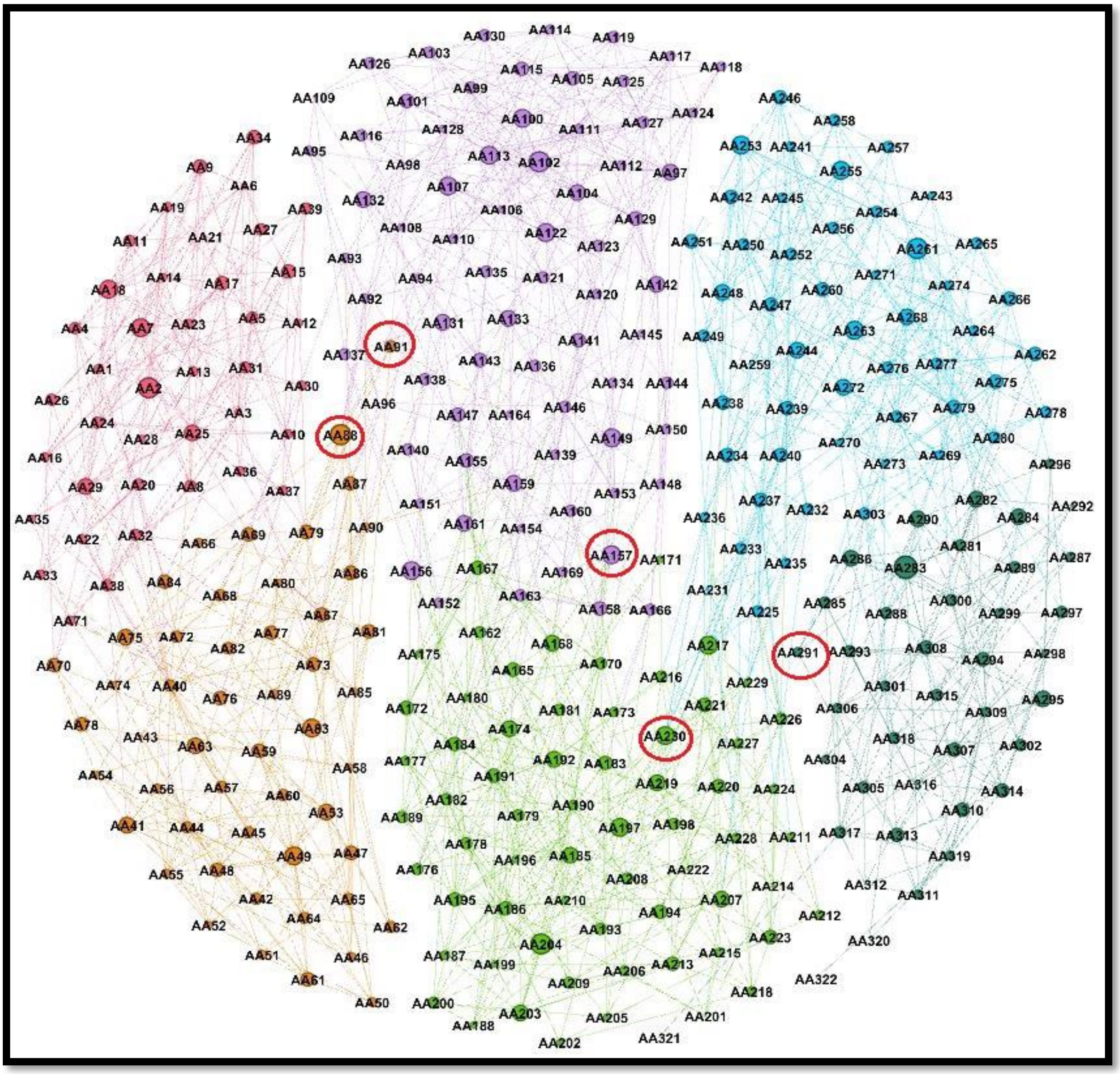


Figure 5.2: Hospitality business network.



Note: Different colours represent different clusters (communities); circles represent the actors (nodes); node size is based on in-degree centrality; links represent the relationships (ties/edges).

Figure 5.3: Hospitality business network - hubs.



Note: Different colours represent different clusters (communities); circles represent the actors (nodes); node size is based on in-degree centrality; links represent the relationships (ties/edges). Red circles highlight the presence of hubs (examples).

Table 5.5 shows the attributes of the FMCG and hospitality business networks. As shown in the table, the FMCG business network consisted of 331 actors (nodes), with 1624 relationships (edges). While in the hospitality business network, there are 322 actors, with a total of 1610 relationships. The actors were distributed into ten clusters (i.e., communities) in the FMCG business network, and into six in the hospitality business network, as visualised in Figures 5.1 and 5.2 respectively. Note that the clusters are represented by different colours in these figures, assigned based on the modularity measure proposed by Newman (2006) using the 'ForceAtlas 2' algorithm (Jacomy *et al.*, 2014).

The number of actors in each cluster within the FMCG and hospitality business networks is shown in Table 5.6. According to the table, each cluster in the FMCG business network contains a smaller number of actors compared to those in the hospitality business network. In essence, as shown in Figures 5.1 and 5.2, the average degree (i.e., the number of edges compared to the number of nodes (Wasserman and Faust, 1994)) in the FMCG business network is 4.906, while in the hospitality business network the average degree is 5. These values suggest that the actors in the FMCG business network tend to send and receive resources to and from relatively fewer actors compared to those in the hospitality business network. Table 5.5 also shows the network diameter for the networks. As shown in Table 5.5, in the FMCG business network, the network diameter is 11. Furthermore, Table 5.5 shows that the hospitality business network has a network diameter of 22. These values suggest that the information and resources travel fast in the FMCG business network, while the slowest transmission of them is in the hospitality business network.

Table 5.5: FMCG and hospitality business networks – Attributes.

Attribute	FMCG	Hospitality
Number of nodes	331	322
Number of edges	1624	1610
Number of clusters (communities)	10	6
Average degree	4.906	5
Network diameter	11	22
Average path length	4.446	7.412
Small-world index	5.749	3.217

Table 5.6: Clusters in FMCG and hospitality business networks (n = 331).

Cluster	FMCG Business Network		Hospitality Business Network	
	No. of actors	%	No. of actors	%
1	67	20.2	40	12.5
2	41	12.4	51	16.0
3	55	16.6	74	23.2
4	18	5.4	64	20.1
5	28	8.5	52	16.3
6	16	4.8	38	11.9
7	19	5.7	——	——
8	33	10.0	——	——
9	25	7.6	——	——
10	29	8.8	——	——

We also calculated the average path length and the small-world index, as recommended by Watts and Strogatz (1998) and Borgatti, Brass and Halgin (2014). As shown in Table 5.5, the FMCG business network has an average path length of 4.446 and small-world index of 5.749, while in the hospitality business network, the average path lengths is 7.412 and, and small-world index is 3.217. Further, we calculated the density of clusters shown in Table 5.7 for the FMCG and hospitality business networks. Table 5.7 shows that the network density in the FMCG business network is 0.015, while in its counterpart, the hospitality business network, it is 0.016. Further, Table 5.7 presents the average closeness centrality for both business networks, which was calculated by importing the results of closeness centrality obtained through Gephi 0.9.2 into using IBM SPSS statistics tool V. 25.0, followed by calculation of the average (means) for each network. As shown in Table 5.7, average closeness centrality for the FMCG and hospitality business networks is 0.231 and 0.138 respectively.

Table 5.7: Closeness centrality means and network density.

Attribute	Business Network	
	FMCG	**Hospitality**
Network density	0.015	0.016
Average closeness centrality	0.231	0.138

We calculated the clustering coefficient using Gephi 0.9.2 and then obtained the average clustering coefficient using IBM SPSS statistics tool V. 25.0. Gephi 0.9.2 employs an algorithm developed by Latapy (2008) based on Watts and Strogatz's (1998) formulas (see Latapy (2008) for the algorithm). Table 5.8 presents the overall network metrics for both business networks.

Table 5.8: FMCG and hospitality business networks – Overall network metrics.

	Attribute	Business Network	
		FMCG	**Hospitality**
1	Fragmentation	0	0.031
2	Connectedness	1	0.969
3	Average clustering coefficient	0.100	0.088
4	Average degree	4.906	5
5	Network diameter	11	22
6	Average path length	4.446	7.412
7	Small-world index	5.749	3.217

Note: Attributes 4-7 are pooled from Table 5.5 and placed in this table for easier visualisation.

Using the UCINET 6.0 software package, we calculated the connectedness and fragmentation metrics. As shown in Table 5.8, in the FMCG business network the connectedness is equal to 1, which indicates that fragmentation is equal to 0 in the network. On the other hand, in the hospitality business network, the connectedness is 0.969 and fragmentation is 0.031.

The SNA findings are discussed in more detail in the following chapter. In the meantime, the chapter proceeds with the next phase of the data analysis, CB-SEM.

5.5 Covariance-based structural equation modelling (CB-SEM)

In section 4.4, we screened both datasets for missing values and in section 5.2 we tested the datasets for non-response bias, ending with a total of 331 and 319 valid responses, with no missing data, for the FMCG and hospitality business networks respectively. In the following section, the pre-analysis tests (prior to CFA, which is the first step in CB-SEM) concerning the measures of reliability and validity are discussed.

5.5.1 Measures of reliability and validity

Before conducting any further analysis, we screened our datasets for both business networks to ensure that they were useable, reliable, and valid for testing our hypotheses. EFA was performed in order to explore the factor structure. The data were then cross-validated by conducting EFA and CFA on a random sample of 80 per cent of the respondents. We started by checking for case outliers on continuous variables; specifically, closeness centrality. We then checked the normality of the constructs; i.e., the distribution shape of the data in terms of skewness (symmetry) and kurtosis (peakedness or flatness), concerning the direct effects, as described in the following sub-section.

5.5.1.1 Data diagnostic for cases outliers

Before we proceed with the normality tests, we explore the SNA raw data, specifically closeness centrality, for possible outliers that may affect the analysis results and cause bias. If outliers do exist, Field (2009) and Hair *et al.* (2010) suggest two approaches to alleviating their effect: (i) remove the record with an outlier, or (ii) replace the outlier value with the average mean. In this study, closeness centrality did not show any outliers in either the FMCG or hospitality business networks, as shown in Appendices 12 and 13.

5.5.1.2 Normality

Given that this research employs the CB-SEM technique in order to analyse the datasets and test the research hypotheses, it is therefore critical to ensure that to some extent the datasets follow a normal distribution (Sarstedt, Ringle and Hair, 2014). In this study, statistical analysis was performed using IBM SPSS statistics tool V. 25.0 in order to determine that the datasets, in particular the items relating to the constructs of networking capability, dialogue, access, risk/benefit assessment, transparency, and firm innovativeness, followed a normal distribution, or at least slight or moderate non-normal distribution, as noted in the arguments presented in section 4.5.1. Therefore, we analysed the datasets for skewness by following Tabachnick and Fidell's (2013) suggestion that absolute values of less than 1.5 for skewness and for kurtosis of less than 3 (Kline, 2015) to some extent indicate normal distribution.

Our results (see Appendices 14 and 15) show that the values of skewness for all the items in both datasets (i.e., FMCG and hospitality) are between 1.5 and -1.5, while the absolute values of kurtosis are lower than 3, apart from one item, access item number 1 (A1), which has values of 3.77 and 4.046 for FMCG and hospitality respectively, as shown in Appendices 14 and 15. Although the kurtosis value of A1 in both networks is still acceptable according to the recommendations mentioned above, it was dropped from the pattern matrix for both networks during the EFA, as explained in the following section. The values of skewness and kurtosis hence satisfy the thresholds of normal distribution / slightly non-normal distribution mentioned above, which also, besides the reasons given in sections 4.5 and 4.7.1, justify the use of CB-SEM. The next step after the normality test was factor analysis.

5.5.1.3 Exploratory factor analysis (EFA), validity and reliability tests

As mentioned in the previous section (section 5.5.1.2), the normality test results reveal that the values of skewness and kurtosis were at acceptable levels to be considered relatively normal; i.e., the shape of the distribution may not be severely non-normal (Kline, 2015), hence the use of the ML algorithm as an extraction method. The results of ML EFA are shown in Appendix 15 for the FMCG business network and Appendix 16 for the hospitality business network.

Child (2006) argues that during EFA, analysts should check the eigenvalues (characteristics roots) of the items in the communalities table, since ones less than 0.2 are problematic in the pattern matrix. The EFA results revealed that the 29 items generated six factors with eigenvalues greater than 0.2. However, one item in both the FMCG and hospitality business networks showed a communality value of less than 0.2 and was thus eliminated, in line with Child's (2006) recommendation. The eliminated item during the first EFA due to a low communality value was networking capability item number 5, i.e., NC5 “We know our partners' products/ procedures/ services”. With this item removed, EFA was rerun using 28 items, and in this phase, three items were removed from each business network pattern matrices due to strong cross-loadings (Comrey and Lee, 1992). In the FMCG business network, these items were dialogue item number 6, i.e., D6 “We emphasise our employees’ efforts to our partners”; and access items numbers 1 and 2, i.e., A1 “We offer opportunities to our partners to share in the design process of services and/or products” and A2 “We offer opportunities to our partners to share in the development process of services and/or products”.

In the hospitality business network, items D6, A1, and access item number 3, i.e., A3 “We offer opportunities to our partners to share in the price-setting process of services and/or products” were removed from the pattern matrix. The final EFA was rerun using 25 items, resulting in a six-factor model with no cross-loadings, which explained 64.914 per cent of the variance within the 25 items in the FMCG business network, and 64.319 in the hospitality business network.

In line with Worthington and Whittaker's (2006) and Tabachnick and Fidell's (2013) recommendations (see section 4.5.2.3), the EFA results show an excellent KMO measure of sampling adequacy of 0.897 for the FMCG business network, and 0.895 for the hospitality business network, suggesting that the data for both business networks are suitable for EFA. Furthermore, Bartlett`s test of sphericity (Bartlett, 1950), shows a Chi-square (X^2) of 4932.409, degrees of freedom (df) = 300, and p value < 0.001 for the FMCG business network. For the hospitality business network, the test shows an X^2 of 4744.227, df = 300, and p-value < 0.001. These results show that the correlations between the constructs are not equal to 0.

We assessed the purified 'clean' pattern matrix for convergent and discriminant validity and reliability. As evidence of convergent validity, all the loadings in the pattern matrix, which measure the correlation between the factors and the observed measures, are above the cut-off criterion of 0.5 recommended by Comrey and Lee (1992), ranging between 0.647 and 0.908 in the FMCG business network, as shown in Appendix 15. In the hospitality business network, item loadings ranged between 0.670 and 0.904, as shown in Appendix 16. The other indicators of convergent validity are assessed in later sections in this chapter.

As evidence of discriminant validity, there were no cross-loadings in the pattern matrix (Costello and Osborne, 2016). Discriminant validity is also checked in section 5.5.2 when performing CFA (see Tables 5.12 and 5.13). Reliability was established by α coefficients all being above 0.7 (Cronbach, 1951) for all the constructs (as shown in Appendix 15 for the FMCG business network and Appendix 16 for the hospitality business network) and α coefficients of 0.910 for the 25 items in FMCG business network, and 0.907 for the hospitality business network.

5.5.1.4 Cross-validation of the data after EFA

Byrne (2010) and Kline (2010) recommend cross-validation as a useful tool to test whether or not items fall under the same factor if EFA is replicated across two samples from the same dataset. In other words, we seek evidence as to whether the scale items i.e., networking capability, dialogue, access, risk/benefit assessment, transparency and firm innovativeness, operate equivalently across the two samples as an indication of robust EFA. Following Kim, Kim and Petrick's (2017) and Kyriazos' (2018) approach to cross-validating data during EFA, we split both datasets randomly into two using the 80/20 per cent split rule (Kyriazos, 2018). Next, EFA was conducted using the SPSS v0.25 software package on a randomly selected 80 per cent sample of both business networks (FMCG: n = 257/ hospitality: n = 262) to better understand the resultant factors of the constructs under study for cross-validating the dataset. The pattern matrix then was subjected to CFA (Hair *et al.*, 2010) using AMOS v0.25 software.

During EFA and CFA, we assessed for unidimensionality in EFA and dimensionality in CFA (Anderson and Gerbing, 1988), and reliability, convergent validity and discriminant validity throughout the process. The cross-validation test yielded similar EFA results for the full datasets of both business networks in terms of the number of factors, reliability, convergent validity and discriminant validity. Therefore, the resulting pattern matrix from EFA for the full datasets was submitted to CFA in order to determine the factor structure of the datasets. Another cross-validation was then performed after CFA. The CFA results are presented and discussed in the following section.

5.5.2 Confirmatory factor analysis (CFA) and measurement model

The measurement model obtained from EFA analysis (consisting of 25 items) was submitted to CFA in order to assess its fit to the dataset used in SEM (Schreiber *et al.*, 2006). Anderson and Gerbing (1988) suggest a two-step approach for performing the latent variable SEM using the ML algorithm. Using AMOS v0.25 software, the measurement model was first examined and then the structural model was tested. We employed a CFA test for the initial measurement model consisting of six construct structures, including 25 items. At the same time, we estimated the initial structure model within a series of dependence relationships between latent variables with multiple indicators (Schreiber *et al.*, 2006; Malhotra and Dash, 2011).

Bases on Bentler's (1998), Marsh, Hau and Wen's (2004), Kline's (2015) and Niemand and Mai's (2018) suggestions, and in accordance with previous studies such as those of Beauducel and Wittmann (2005) and Iacobucci (2010), this research employed the X^2, df, X^2 /df, GFI, CFI, TLI, IFI, RMSEA, and SRMR indices in order to assess the fitness of the measurement and structural models (see section 4.5.3.1).

The CFA results for the initial measurement model for both business networks revealed acceptable model fit indices for X^2, df, X^2 /df, GFI, CFI, TLI, IFI, RMSEA, and SRMR. The goodness-of-fit indices for the initial models are presented in Table 5.9. Values above 0.9 represent a good model fit for GFI and CFI (Hair *et al.*, 2010), whereas those above 0.8 are acceptable (Baumgartner and Homburg, 1996). Values lower than 0.07 represent a good model fit for RMSEA, whereas ones lower than 0.1 are acceptable (Hu and Bentler, 1998). Values above 0.95 represent a good model fit for TLI and IFI (Marsh, Hau and Wen, 2004), whereas TLI values between 0.8 and 0.9 indicate a mediocre fit (Bentler, 1990; Sharma *et al.*, 2005). Values between 1 and 3 represent a good model fit for X^2 /df (Hu and Bentler, 1998).

Table 5.9: Measurement model fit indices.

BN	X^2 [df]	X^2 /df	GFI	CFI	TLI	IFI	RMSEA	SRMR
FMCG	324.859 [260]	1.249	0.930	0.986	0.984	0.987	0.027	0.039
Hospitality	350.988 [260]	1.350	0.922	0.980	0.977	0.980	0.033	0.041

Note: BN = Business network; X^2 = Chi-Square; df = degrees of freedom; GFI = goodness of fit index; CFI = comparative fit index; TLI = Tucker Lewis index; IFI = incremental fit index; RMSEA = root mean square error of approximation; SRMR = standardised root mean residual.

We assessed the initial measurement model for convergent validity, discriminant validity and composite reliability. As evidence of convergent validity, all the loadings in the pattern matrix are above 0.5, with no cross-loadings (Appendices 16 and 17), which indicates evidence of discriminant validity (Costello and Osborne, 2016). During CFA, Tables 5.10 and 5.11 show that convergent validity was established for all items, evidenced by all the loadings (i.e., standardised estimates) being higher than 0.6, as recommended by Bagozzi and Yi (1988), and significant t values at $p < 0.001$.

Table 5.10: Results of confirmatory factor analysis – FMCG business network (n=331).

Construct	Item	Standardised estimates	*t*-value
Networking Capability (NC)	NC1	0.827	——
	NC2	0.880	19.047
	NC3	0.818	17.224
	NC4	0.827	17.505
Dialogue (D)	D1	0.802	——
	D2	0.819	16.330
	D3	0.835	16.724
	D4	0.798	15.807
	D5	0.707	13.565
Access (A)	A3	0.855	——
	A4	0.792	15.194
	A5	0.783	15.028
Risk (R)	R1	0.782	——
	R2	0.756	14.498
	R3	0.857	16.881
	R4	0.871	17.198
	R5	0.719	13.653
Transparency (T)	T1	0.745	——
	T2	0.817	14.822
	T3	0.834	15.149
	T4	0.829	15.046
	T5	0.776	14.026
Firm Innovativeness (INNS)	INNS1	0.758	——
	INNS2	0.738	11.778
	INNS3	0.762	12.014

Note: n=331; all factor loadings are significant at *** $p < 0.001$.

Table 5.11: Results of confirmatory factor analysis – Hospitality business network (n=319).

Construct	Item	Standardised estimates	*t*-value
Networking Capability (NC)	NC1	0.823	——
	NC2	0.879	18.358
	NC3	0.799	16.167
	NC4	0.814	16.577
Dialogue (D)	D1	0.821	——
	D2	0.842	17.500
	D3	0.855	17.876
	D4	0.81	16.562
	D5	0.721	14.144
Access (A)	A2	0.767	——
	A4	0.774	12.903
	A5	0.795	13.150
Risk (R)	R1	0.771	——
	R2	0.730	13.451
	R3	0.844	15.937
	R4	0.889	16.849
	R5	0.719	13.198
Transparency (T)	T1	0.745	——
	T2	0.803	14.242
	T3	0.832	14.773
	T4	0.832	14.773
	T5	0.770	13.617
Firm Innovativeness (INNS)	INNS1	0.760	——
	INNS2	0.729	11.395
	INNS3	0.756	11.655

Note: n=319; all factor loadings are significant at *** $p < 0.001$.

Subsequently, Tables 5.12 and 5.13 show the correlation matrix used in the study. We have discriminant validity based on the square root of AVE (shown in Tables 5.12 and 5.13 in bold on the diagonal) ranging between 0.753 and 0.839 for the FMCG business network, and 0.749 and 0.829 for the hospitality business network been greater than any factor correlation (Fornell and Larcker, 1981). Convergent validity is evidenced by AVE values all above 0.5 (Fornell and Larcker, 1981). It can also be observed in Tables 5.12 and 5.13 that composite reliability (CR) is established, as there is evidence of the CR values all being above 0.7 (Nunnally, 1978).

Table 5.12. Descriptive statistics and correlations for study constructs – FMCG business network (n = 331).

	S.D.	Mean	CR	AVE	MSV	1	2	3	4	5	6
1. Transparency	0.76558	2.6274	0.899	0.641	0.29	**0.801**					
2. Risk assessment	0.66023	2.8692	0.898	0.639	0.23	0.337***	**0.799**				
3. Dialogue	0.59712	3.8934	0.894	0.63	0.164	0.232***	0.336***	**0.794**			
4. Networking capability	0.60192	3.5229	0.904	0.703	0.23	0.355***	0.479***	0.367***	**0.839**		
5. Access	0.57775	3.7719	0.852	0.658	0.216	0.266***	0.410***	0.406***	0.465***	**0.811**	
6. Firm Innovativeness	0.73588	3.3097	0.797	0.567	0.29	0.538***	0.373***	0.400***	0.315***	0.349***	**0.753**

Table 5.13. Descriptive statistics and correlations for study constructs – Hospitality business network (n = 319).

	S.D.	Mean	CR	AVE	MSV	1	2	3	4	5	6
1. Dialogue	0.61956	3.8907	0.906	0.658	0.26	**0.811**					
2. Transparency	0.76208	2.6047	0.897	0.635	0.264	0.189**	**0.797**				
3. Risk assessment	0.64223	2.7669	0.894	0.629	0.222	0.294***	0.302***	**0.793**			
4. Networking capability	0.59800	3.5255	0.898	0.688	0.327	0.357***	0.334***	0.471***	**0.829**		
5. Access	0.52698	3.5686	0.822	0.607	0.327	0.510***	0.274***	0.449***	0.571***	**0.779**	
6. Firm Innovativeness	0.74378	3.4119	0.793	0.561	0.264	0.392***	0.514***	0.375***	0.309***	0.404***	**0.749**

Note: S.D. = Standard Deviation; CR=Composite Reliability; AVE= Average Variance Extracted; MSV=Maximum Shared Variance. Shown in bold on the main diagonal are the square root of the AVE for each scale that should be higher than the correlation between the scale and the rest.
Significance of Correlations: *** $p < 0.001$; ** $p < 0.010$; * $p < 0.050$.

After establishing discriminant and convergent validity, and composite reliability for the measurement model for each business network, and before testing the structural model, we continue the analysis by conducting another cross-validation test and then testing for CMB, as described below.

5.5.3 Cross-validation of the data after CFA

In line with Browne and Cudeck's (1989) recommendations (see section 4.5.3.2), we split the datasets from both business networks randomly into two subgroups of fairly similar size from the same population. For the FMCG business network, the first sample was called the calibration sample (n = 166 out of 331) and the second sample the validation sample (n = 165 out of 331), while for the hospitality business network, the calibration sample was n = 160 out of 319, and the validation sample n = 159 out of 319. We ran multiple-group CFA using the AMOS 25 software package. During this analysis, we also assessed all the models across the groups for dimensionality, convergent validity and discriminant validity throughout the process. In this test there were three models i.e., the hypothesised model, the saturated model and the independence model to be assessed against each other.

In both business networks, the measurement model was identical, and the model fit incidence, i.e., X^2, df, X^2 /df, GFI, CFI, TLI, IFI, RMSEA, and SRMR, as shown in Table 5.14, achieved acceptable levels conforming to the values recommended in the literature (see section 4.5.3.1 for the cut-off criteria). When running the analysis in AMOS 25 software package, the results for both business networks showed that all the regression paths in the hypothesised model were significant, at $p < 0.001$ and $p < 0.05$ across groups. This is further evidence of configural invariance across groups.

We next computed the ECVI for each model, i.e., the hypothesised, saturated and independent ones, as shown in Table 5.14, then compared the ECVI values by rank order. In accordance with Byrne's (2010) recommendations (see section 4.5.3.2), the results shown in Table 5.14 demonstrate that the hypothesised model in the FMCG business network has the lowest ECVI value of 2.748, compared to 3.951 for the saturated model and 16.786 for the independence model. In addition, the results presented in Table 5.14 show that the hypothesised model in the hospitality business network has the lowest ECVI value of 3.133, compared 4.101 for the saturated model and 17.129 for the independence model. Therefore, it can be said that the hypothesised model adequately reproduces the covariance matrix under observation. Moreover, following Hu and Bentler's (1998) suggestion, the SRMR value of 0.056 indicates that the hypothesised model explains the correlations to within an average error of 0.056 (see Appendix 10 for an SRMR description). In essence, our hypothesised model demonstrates its robustness and the potential of replication across other datasets.

Table 5.14: Multiple-group cross-validation for the measurement models (both business networks).

	FMCG Business Network												
Model description	Model Fit Indices												
	X^2	df	*p*-value	X^2 /df	GFI	CFI	TLI	IFI	RMSEA	SRMR	ECVI	LO 90	HI 90
Hypothesised	644.121	520	0.000	1.239	0.874	0.974	0.970	0.975	0.027	0.056	2.748	2.564	2.957
Saturated	0.000	0	-----	----	1.000	1.000	----	1.000	----	----	3.951	3.951	3.951
Independence	5422.706	600	0.000	9.038	0.271	0.000	0.000	0.000	0.156	----	16.786	16.081	17.512
	Hospitality Business Network												
	Model Fit Indices												
Model description	X^2	df	*p*-value	X^2 /df	GFI	CFI	TLI	IFI	RMSEA	SRMR	ECVI	LO 90	HI 90
Hypothesised	733.096	520	0.000	1.410	0.852	0.955	0.948	0.956	0.36	0.056	3.133	2.920	3.371
Saturated	650	0	----	----	1.000	1.000	----	1.000	----	----	4.101	4.101	4.101
Independence	5329.962	600	0.000	8.883	0.270	0.000	0.000	0.000	0.158	----	17.129	16.404	17.875

Note: X^2 = Chi-Square; df = degrees of freedom; Significance of *p*-value: $p < 0.001$; X^2 /df = X^2 to df ratio; GFI = Goodness of fit index; CFI = Comparative fit index ; TLI = Tucker Lewis index; IFI = Incremental fit index; RMSEA = Root mean square error of approximation; SRMR = Standardised root mean residual; ECVI = Expected cross-validation index; LO 90 = Lower limit of a 90 per cent confidence interval; HI 90 = Upper limit of a 90 per cent confidence interval.

Finally, Table 5.14 shows an ECVI value of 2.748, which lies between the LO 90 value of 2.564 and the HI 90 value of 2.957 for the FMCG business network, while for the hospitality business network, the ECVI value of 3.133 lies between the LO 90 value of 2.920 and the HI 90 value of 3.371. Taken together, the results of the cross-validation suggest that our hypothesised model is well fitting and represents a reasonable approximation of the population. After ensuring that the items in the measurement model were functioning equivalently across different population samples, we proceeded with the next step of the CB-SEM analysis, CMB, which is discussed in the following section.

5.5.4 Testing for common method bias (CMB)

This study employs the instrumental variable technique and the latent variable CB-SEM using the ML algorithm in the AMOS 25 software package in order to address CMB and other potential endogeneity issues. As mentioned in the research methodology chapter (Chapter 4), we followed Podsakoff *et al.*'s (2003) and MacKenzie and Podsakoff's (2012) recommendations to control for CMB. We applied both ex-ante remedies such as using a marker item in the survey (attention trap) and ex-post remedies by employing the CLF method, i.e., social desirability. The CLF was employed to test whether the shared variance across all the construct items was significantly different than zero by performing a $\Delta\ \chi^2$ test between the unconstrained and fully constrained models, in which all the model paths were constrained to zero (Podsakoff *et al.*, 2003). After introducing the CLF, the goodness-of-fit of the measurement model with the CLF model was good, as shown in Table 5.15.

Table 5.15: Model fit indices during CMB.

BN	X^2 [df]	X^2 /df	GFI	CFI	TLI	IFI	RMSEA	SRMR
FMCG	598.638 [366]	1.636	0.896	0.953	0.944	0.954	0.044	0.076
Hospitality	600.755 [366]	1.641	0.894	0.950	0.941	0.951	0.045	0.064

Note: BN = Business network; X^2 = Chi-Square; df = degrees of freedom; GFI = goodness of fit index; CFI = comparative fit index; TLI = Tucker Lewis index; IFI = incremental fit index; RMSEA = root mean square error of approximation; SRMR = standardised root mean residual.

The results of the X^2 difference test showed that the constrained and unconstrained models in the FMCG (Table 5.16) and hospitality (Table 5.17) business networks were invariant. We were hence unable to detect any specific response bias affecting the measurement model.

Table 5.16: CMB, Chi-square difference test – FMCG business network.

Model	X^2	df	Delta (Δ)	*p*-value
Unconstrained Model	598.638	366	X^2=0.000	0.001
Zero Constrained Model	598.638	366	df=0	

Note: X^2 = Chi-Square; df = degrees of freedom; *p*-value = significance of correlations.

Table 5.17: CMB, Chi-square difference test – Hospitality business network.

Model	X^2	df	Delta (Δ)	*p*-value
Unconstrained Model	600.755	366	X^2=0.000	0.001
Zero Constrained Model	600.755	366	df=0	

Note: X^2 = Chi-Square; df = degrees of freedom; *p*-value = significance of correlations.

When performing SEM analysis, it is crucial to satisfy pre-requisite assumptions before testing the structural model (Kline, 2010; Lowry and Gaskin 2014) in order to arrive at correct estimates of the relationships under investigation. We tested the research framework constructs for the multivariate assumptions, i.e., the variance inflation factor, Pearson correlation, and Cook`s distance; these are discussed in the following section.

5.5.5 Multivariate assumptions

5.5.5.1 Testing for the variance inflation factor (VIF)

Multi-collinearity refers to a situation in a multiple regression model in which at least two of the explanatory constructs are highly correlated, therefore producing a false estimate of the relationship between the explanatory and the outcome constructs (Hair *et al.*, 2010). According to Kline (2010, 2011), perfect multi-collinearity of the constructs occurs when the correlation between any two explanatory constructs is equal to 1 or -1, while the constructs are still deemed to be highly correlated if the correlation value is above 0.85 or -0.85. We performed a multi-collinearity test by applying the VIF in order to test variation tolerance and to detect any high correlation (i.e., multi-collinearity) among the constructs. The results in Table 5.18 (FMCG) and Table 5.19 (hospitality business) show that the VIF value for each variable is less than 3 and the tolerance values are all greater than 0.1, which indicates that there is no correlation problem between the construct variables (Hair *et al.*, 1995).

Table 5.18: Collinearity statistics – FMCG business network.

Model	Tolerance	VIF
NC	0.590	1.694
D	0.739	1.353
A	0.629	1.589
R	0.646	1.548
T	0.803	1.245

Note: Dependent variable: INNS = Firm Innovativeness.
VIF = Variance Inflation Factor; NC =Networking Capability; D = Dialogue; A = Access; R = Risk/benefit assessment; T = Transparency.

Table 5.19: Collinearity statistics – Hospitality business network.

Model	Tolerance	VIF
NC	0.524	1.910
D	0.671	1.490
A	0.442	2.262
R	0.665	1.504
T	0.834	1.199

Note: Dependent variable: INNS = Firm Innovativeness.
VIF = Variance Inflation Factor; NC =Networking Capability; D = Dialogue; A = Access; R = Risk/benefit assessment; T = Transparency.

Another test to check for multi-collinearity suggested by Kline (2010) is the bivariate collinearity test. Bivariate collinearity exists between two constructs if their correlation in the correlation matrix is high (i.e., above 0.85 or -0.85). We examined the factor correlation matrix (Appendices 18 and 19) after performing EFA, and all the correlation values were lower than 0.85, with 0.528 being the highest value between transparency and innovativeness in the FMCG business network (Appendix 18), and 0.548 the highest value between networking capability and access in the hospitality business network (Appendix 19).

These results demonstrate that the constructs do not suffer from multi-collinearity issues. In fact, according to Ferguson and Cox (1993) and Kline (2010), the absence of high correlation between the factors in the factor correlation matrix is another way to prove discriminant validity during EFA (Hair *et al.*, 2010). In essence, the bivariate collinearity test showed another evidence of discriminant validity. However, as multi-collinearity should be assessed at various stages during the data analysis (Kline, 2010), we, therefore, assessed it after performing CFA and CBM through Pearson correlation analysis, as discussed in the following section.

5.5.5.2 Pearson correlation and Cook`s distance

Before testing the structural model, we ran a Pearson correlation analysis in order to test the independence of the IVs. The results show that there is a positive significant correlation at α =0.01 between the IVs, with 0.522 being the strongest value between networking capability and risk/benefit assessment in the FMCG business network (Table 5.20), and with 0.641 being the strongest value between networking capability and access in the hospitality business network (Table 5.21).

Table 5.20: Pearson correlation – FMCG business network.

	NC	D	A	R	T
NC	1				
D	0.403**	1			
A	0.518**	0.454**	1		
R	**0.522****	0.369**	0.458**	1	
T	0.388**	0.257**	0.300**	0.370**	1

Note: **. Correlation is significant at the 0.01 level (2-tailed).
n = 331; NC= Networking Capability; D = Dialogue; A = Access; R = Risk/benefit assessment; T = Transparency.

Table 5.21: Pearson correlation – Hospitality business network.

	NC	D	A	R	T
NC	1				
D	0.391**	1			
A	**0.641****	0.571**	1		
R	0.514**	0.322**	0.507**	1	
T	0.366**	0.208**	0.314**	0.332**	1

Note: **. Correlation is significant at the 0.01 level (2-tailed).
n = 319; NC= Networking Capability; D = Dialogue; A = Access; R = Risk/benefit assessment; T = Transparency.

We tested our constructs for influentials by employing Cook`s distance analysis in order to detect influential records in our datasets. Values higher than 1 are considered to be influential (Cook and Weisberg, 1982); the analysis revealed that all records were lower than 0.065 for the FMCG business network (see Appendix 20) and for hospitality business network (see Appendix 21). Therefore, we have no influential records that might affect the data analysis.

To this end, the pre-requisite multivariate assumptions required for SEM are satisfied, and consequently the chapter proceeds by testing the structural model and reporting the model fit indices for each step, starting with the initial model before CFA, up to the final full structural model.

5.5.6 Structural model

After having established the discriminant and convergent validity of the constructs for each network, i.e., FMCG and hospitality, we tested the model fit indices for the structural models, i.e., a basic model of direct effects (model 1); the interaction effect of in-degree centrality with networking capability as a moderator of the relationship between networking and access (model 2); the interaction effect of closeness centrality with networking capability as a moderator of the relationship between networking and access (model 3); and the full structural model with direct and indirect effects (model 4). Overall, our hypothesised full model (i.e., model 4) provided an acceptable fit for the data (X^2 / df = 1.774; GFI = 0.972; CFI = 0.960; TLI = 0.904; IFI = 0.962; RMSEA = 0.048; SRMR = 0.048) for the FMCG business network, as shown in Table 5.22. For the hospitality business network, our hypothesised full model (i.e., model 4) also provided an acceptable fit for the data (X^2 / df = 1.765; GFI = 0.973; CFI = 0.968; TLI = 0.924; IFI = 0.969; RMSEA = 0.049; SRMR = 0.043), as shown in Table 5.22.

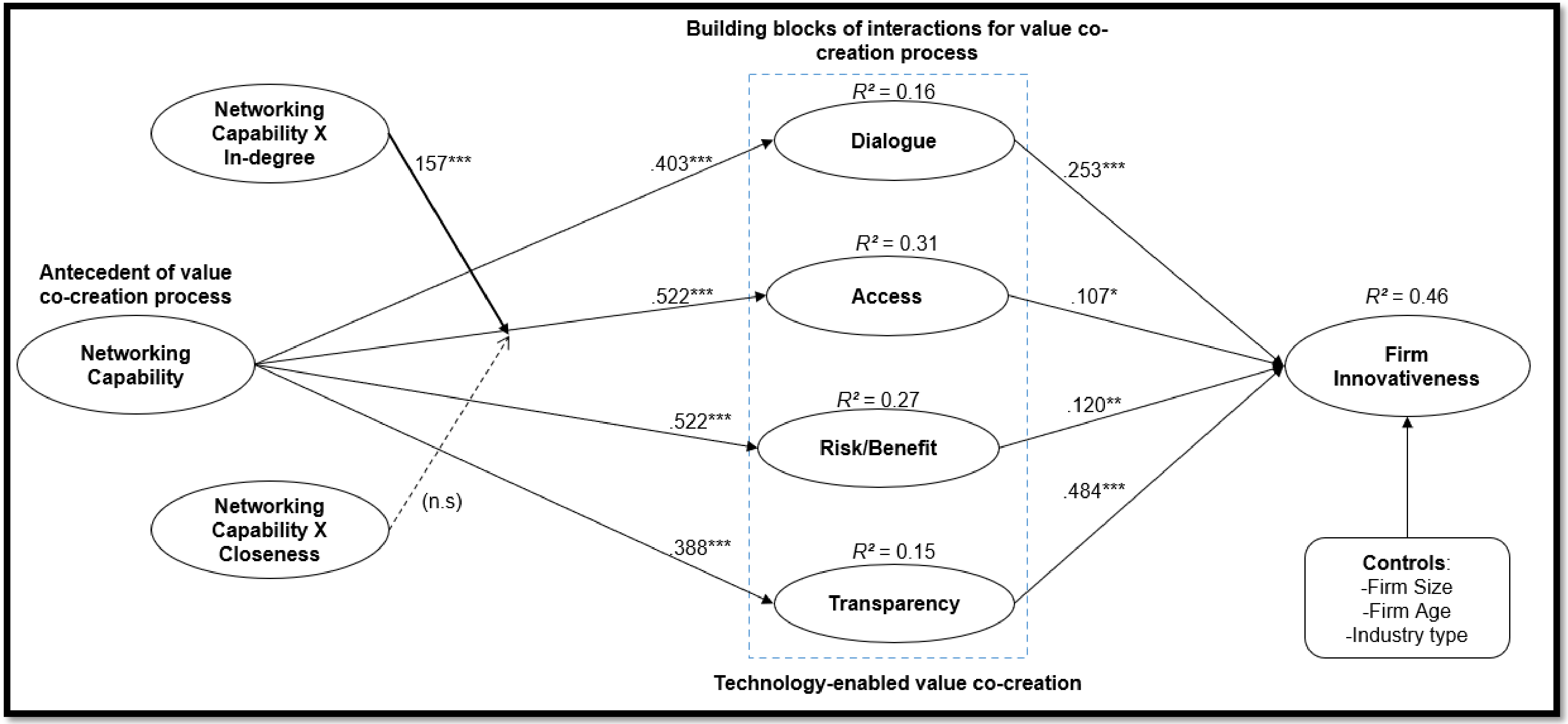
Table 5.22: Model fit indices – Structural models (both business networks).

Model	Model Fit Indices - FMCG Business Network								
	X^2	df	X^2 /df	GFI	CFI	TLI	IFI	RMSEA	SRMR
1	47.157	17	2.774	0.967	0.952	0.898	0.953	0.073	0.065
2	52.124	25	2.085	0.970	0.958	0.907	0.959	0.057	0.054
3	53.157	25	2.126	0.969	0.954	0.900	0.956	0.058	0.056
4	58.542	33	1.774	0.972	0.960	0.904	0.962	0.048	0.048
Model	**Model Fit Indices - Hospitality Business Network**								
	X^2	df	X^2 /df	GFI	CFI	TLI	IFI	RMSEA	SRMR
1	35.418	17	2.083	0.975	0.974	0.944	0.974	0.058	0.052
2	41.22	25	1.649	0.977	0.977	0.949	0.978	0.045	0.046
3	51.434	25	2.057	0.972	0.966	0.925	0.967	0.058	0.049
4	58.26	33	1.765	0.973	0.968	0.924	0.969	0.049	0.043

Note: Model 1 = Structural model – Direct effects; Model 2 = Structural model – Moderation – In-degree centrality; Model 3 = Structural model – Moderation – Closeness centrality; Model 4 = Structural model – Full model; X^2 = Chi-Square; df = degrees of freedom; GFI = goodness of fit index; CFI = comparative fit index; TLI = Tucker Lewis index; IFI = incremental fit index; RMSEA = root mean square error of approximation; SRMR = standardised root mean residual.

All our direct effect hypotheses were supported by the data. Figures 5.4 and 5.5 show the standardised path coefficients; i.e., the β coefficients, and the coefficients of determination (R^2) for the final model of the direct and indirect effects for the FMCG and hospitality business networks respectively. In the following section, the research hypotheses are tested, including the direct effects, while the indirect effects are tested in section 5.7.

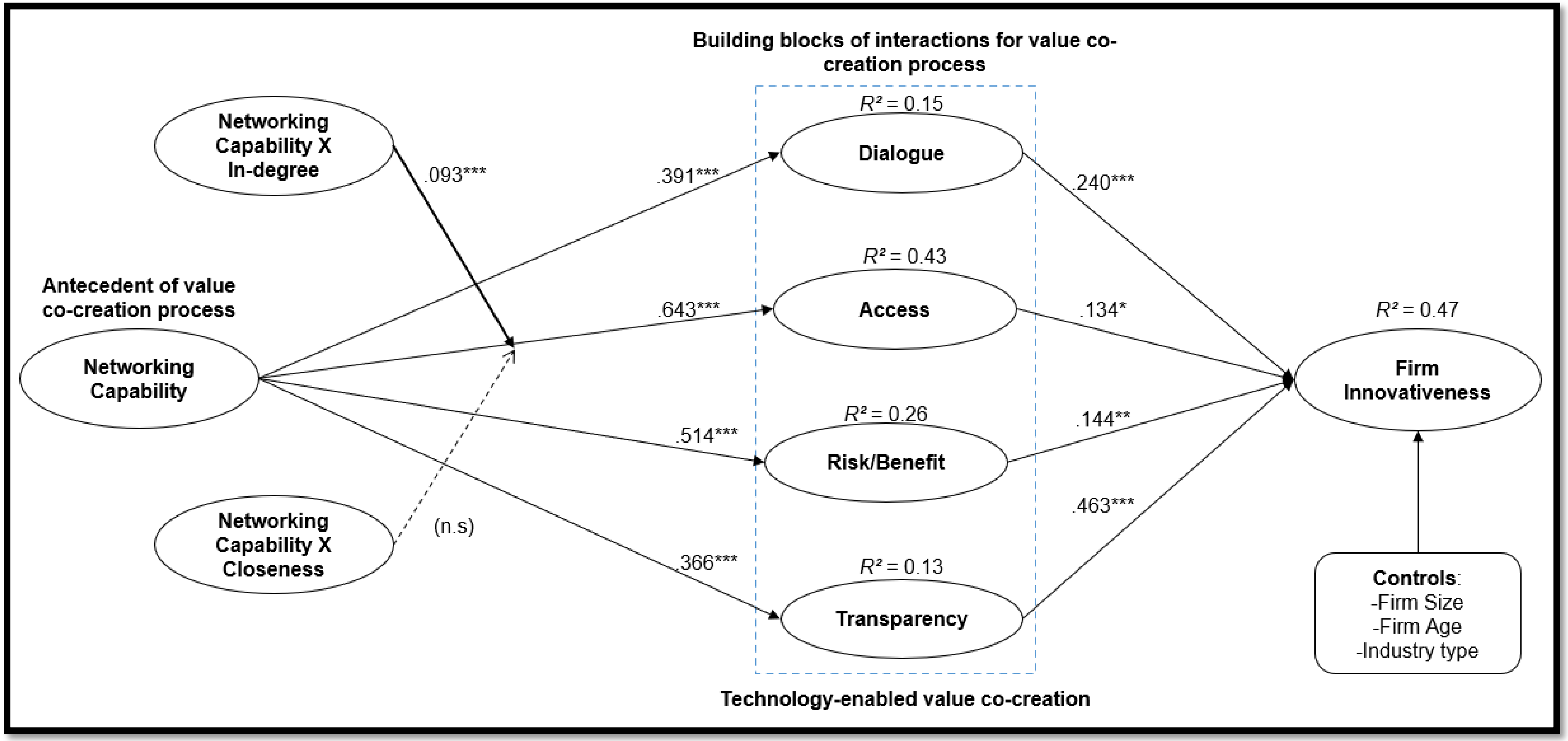
Figure 5.4: Full structural model – FMCG business network.



Note: n.s = Not supported; R² = Coefficient of determination; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

⟶ supported directional path; - - - -▸ unsupported directional path.

Figure 5.5: Full structural model – Hospitality business network.



Note: n.s = Not supported; R^2 = Coefficient of determination; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

supported directional path; unsupported directional path.

5.6 Hypothesis testing – Direct effects

When controlling for firm age, firm size and industry type for both business networks, the hypothesis testing results for the FMCG business network showed that networking capability explained 16 per cent, 31 per cent, 27 per cent, and 15 per cent of the variance of dialogue, access, risk/benefit assessment, and transparency respectively. On the other hand, the results for the hospitality business network showed that networking capability explained 15 per cent, 43 per cent, 26 per cent, and 13 per cent of the variance of dialogue, access, risk/benefit assessment, and transparency respectively. In addition, the DART model explained 46 per cent of the variance of firm innovativeness in the FMCG business network. On the other hand, the DART model explained 47 per cent of the variance of firm innovativeness in the hospitality business network.

Tables 5.23 and 5.24 show the results of the SEM analysis for the FMCG and hospitality business networks respectively. These include all the hypothesised direct effects between all the regression paths, the standardised estimates, and t statistics. Hypotheses 1a-d predicted a positive relationship between networking capability and the DART model. In the FMCG business network, networking capability has a significant positive effect on dialogue ($\beta = 0.403$, $t = 7.995$, $p < 0.01$), access ($\beta = 0.522$, $t = 11.255$, $p < 0.001$), risk/benefit assessment ($\beta = 0.522$, $t = 11.117$, $p < 0.01$), and transparency ($\beta = 0.388$, $t = 7.648$, $p < 0.001$). In the hospitality business network, networking capability has a significant positive effect on dialogue ($\beta = 0.391$, $t = 7.567$, $p < 0.001$), access ($\beta = 0.643$, $t = 15.074$, $p < 0.001$), risk/benefit assessment ($\beta = 0.514$, $t = 10.680$, $p < 0.01$) and transparency ($\beta = 0.366$, $t = 7.017$, $p < 0.001$). These results confirm that networking capability is positively and significantly associated with the DART model. Therefore, hypotheses 1a-d are supported. Overall, in both business networks (FMCG and hospitality), networking capability shows the strongest association with access to resources compared to the rest of the DART model components.

Hypotheses 2a-d predicted a positive relationship between the DART model and firm innovativeness. As shown in Tables 5.23 and 5.24, for the FMCG business network, the effects of dialogue, access, risk/benefit assessment, and transparency on firm innovativeness were positive and significant at ($\beta = 0.253$, $t = 5.650$, $p < 0.001$), ($\beta = 0.107$, $t = 2.221$, $p < 0.05$), ($\beta = 0.120$, $t = 2.679$, $p < 0.01$), and ($\beta = 0.484$, $t = 11.605$, $p < 0.001$) respectively. For the hospitality business network, the effects of dialogue, access, risk/benefit assessment, and transparency on firm innovativeness were positive and significant, at ($\beta = 0.240$, $t = 4.862$, $p < 0.001$), ($\beta = 0.134$, $t = 2.417$, $p < 0.05$), ($\beta = 0.144$, $t = 3.078$, $p < 0.01$), and ($\beta = 0.463$, $t = 10.948$, $p < 0.001$) respectively. These results confirm that the DART model is positively and significantly associated with firm innovativeness, supporting Hypotheses 2a-d. Overall, in both business networks (FMCG and hospitality), transparency between the actors shows the strongest association with firm innovativeness.

Table 5.23: Results of structural equation modelling – Direct effects – FMCG business network (n = 331).

Regression path	Standardised estimates	*t* - value	Result
Hypothesis 1a: Networking capability→ Dialogue	0.403	7.995**	Supported
Hypothesis 1b: Networking capability → Access	0.522	11.255***	Supported
Hypothesis 1c: Networking capability → Risk/benefit assessment	0.522	11.117**	Supported
Hypothesis 1d: Networking capability → Transparency	0.388	7.648***	Supported
Hypothesis 2a: Dialogue → Firm innovativeness	0.253	5.650***	Supported
Hypothesis 2b: Access → Firm innovativeness	0.107	2.221*	Supported
Hypothesis 2c: Risk/benefit assessment → Firm innovativeness	0.120	2.679**	Supported
Hypothesis 2d: Transparency → Firm innovativeness	0.484	11.605***	Supported

Note: * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

Table 5.24: Results of structural equation modelling – Direct effects – Hospitality business network (n = 319).

Regression path	Standardised estimates	*t* - value	Result
Hypothesis 1a: Networking capability→ Dialogue	0.391	7.567***	Supported
Hypothesis 1b: Networking capability → Access	0.643	15.074***	Supported
Hypothesis 1c: Networking capability → Risk/benefit assessment	0.514	10.680**	Supported
Hypothesis 1d: Networking capability → Transparency	0.366	7.017***	Supported
Hypothesis 2a: Dialogue → Firm innovativeness	0.240	4.862***	Supported
Hypothesis 2b: Access → Firm innovativeness	0.134	2.417*	Supported
Hypothesis 2c: Risk/benefit assessment → Firm innovativeness	0.144	3.078**	Supported
Hypothesis 2d: Transparency → Firm innovativeness	0.463	10.948***	Supported

Note: * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

5.7 Hypothesis testing – The moderating role of network position

According to Hair *et al.* (2016), a moderation effect is the joint effect (interaction) of two exogenous constructs i.e., moderator construct (M) and exogenous construct (X), in addition to the individual main effect. The moderation effect can change the relationship between exogenous construct (X) and endogenous construct (Y) by making the relationship stronger, weaker, or by changing signs (e.g., from a direct relationship to an inverse one). The moderation effect can be inferred when the effect of the interaction term on the endogenous variable proves to be significant (Hair *et al.*, 2016). Specifically, the moderator (M) construct affects the value of the slope of the exogenous construct (X) on the endogenous construct (Y) (Hair *et al.*, 2016).

According to Kenny (2018), the effect of the moderator is conceptualised statistically as interaction, and quantified by adding the interaction term between the moderator construct (M) and exogenous construct (X) (i.e., M * X), while regressing the endogenous construct (Y) on the exogenous construct (X). The moderation effect can be estimated using the following multiple regression equation:

Equation 5.1: Multiple regression – Moderation effect.

$$\boldsymbol{Y = i + aX + bM + cXM + \epsilon}$$

Source: Kenny (2018)

where:

a = main effect of X (when M equals zero).

b = main effect of M (when X equals zero).

c = interaction between X and M (measures the interaction effect (XM)).

ϵ = error term.

The effect of X on Y is (a + cM) (Kenny, 2018). Therefore, in our research the effect of X (i.e., networking capability) on Y (i.e., access to resources) changes by a constant amount as M (network position) increases or decreases.

When performing CB-SEM to test our structural model using the IBM AMOS 25 software package, we tested the moderation hypotheses simultaneously with the direct effect hypotheses in the proposed model. As discussed in section 5.5.6 concerning the structural model, we tested each moderation hypothesis separately, i.e., in-degree centrality (model 2) and closeness centrality (model 3), followed by the full model (model 4), which includes all the direct and indirect effects. As shown in Table 5.22 for the FMCG and hospitality business networks, our hypothesised models provided an acceptable fit for the data (X^2 / df; GFI; CFI; TLI; IFI; RMSEA; SRMR) in accordance with the cut-off criteria of Hu and Bentler (1998), Baumgartner and Homburg (1996), Marsh, Hau and Wen (2004) and Hair *et al.* (2010).

In the following sub-sections, we discuss the moderation role of in-degree centrality and closeness centrality separately.

5.7.1 Hypothesis 3 – The moderating role of in-degree centrality

Hypothesis 3 predicted that in-degree centrality would positively moderate the relationship between networking capability and actors` ability to access embedded resources in the business network. It was emphasised that the positive association between networking capability and access increases as in-degree centrality increases. We tested this hypothesis in the two business networks as follows.

For the FMCG business network, the results in Table 5.25 reveal that the interaction between in-degree centrality and networking capability is positive and significant ($\beta = 0.157$, $t = 3.627$, $p < 0.001$), thus supporting Hypothesis 3.

Table 5.25: Results of structural equation modeling – In-degree centrality – FMCG business network (n = 331).

Regression path	Indirect effect		Result
	Standardised estimates	***t* - value**	
Hypothesis 3: Networking capability_x_In-degree centrality→ Access	0.157	3.627***	**Supported**

Note: *t* – value significant at: * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

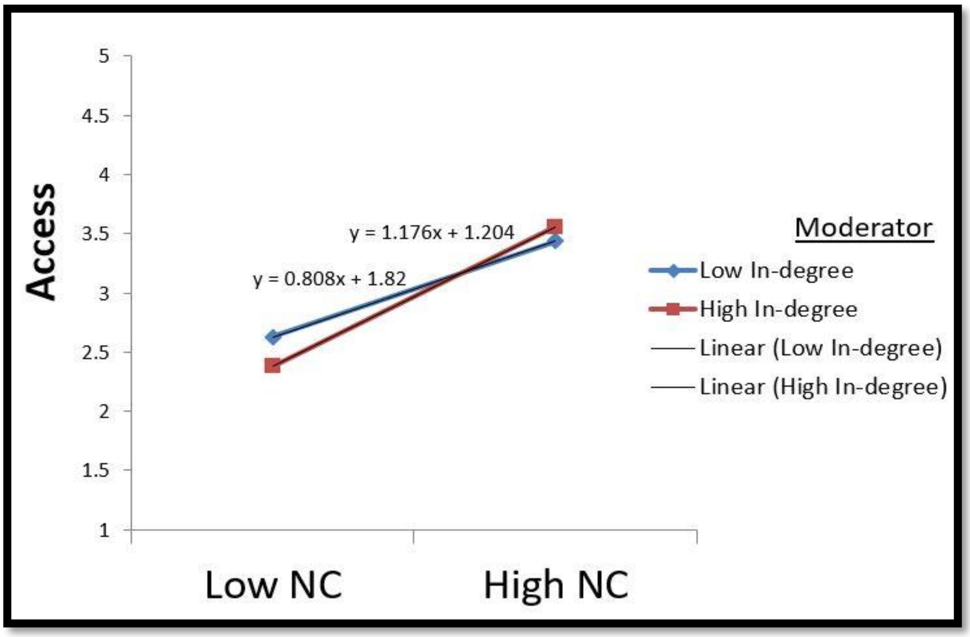
The moderating effect of in-degree centrality on the relationship between networking capability and access in the FMCG business network is plotted in Figure 5.6 using the MS Excel macro tool (Dawson, no date). The unstandardised estimates (unstandardised regression coefficients), including the intercept used to plot the interaction effect, are presented in Table 5.26. As shown in Figures 5.6, in-degree centrality strengthens the positive relationship between networking capability and access in the FMCG business network.

Table 5.26: Unstandardised estimates for regression paths on access – FMCG business network (n = 331).

	ZNC (Exogenous construct **X**)	ZIn-degree (Moderator **M**)	ZNC_X_ZIndegree (Interaction effect **XM**)
Value	0.497	-0.030	0.093

Note: ZNC = Standardised networking capability; ZIn-degree = Standardised in-degree centrality.

Figure 5.6: Interaction effect of in-degree centrality on the networking capability-access relationship (FMCG business network).



Note: NC = Networking capability.

In the hospitality business network, our results (Table 5.27) show that the interaction between in-degree centrality and networking capability is positive and significant (β = 0.093, $t = 2.497$, $p < 0.05$), thus supporting Hypothesis 3.

Table 5.27: Results of structural equation modelling – In-degree centrality – Hospitality business network (n = 319).

Regression path	**Indirect effect**		**Result**
	Standardised estimates	***t* - value**	
Hypothesis 3: Networking capability_x_In-degree centrality→ Access	0.093	2.497*	**Supported**

Note: *t* – value significant at: * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

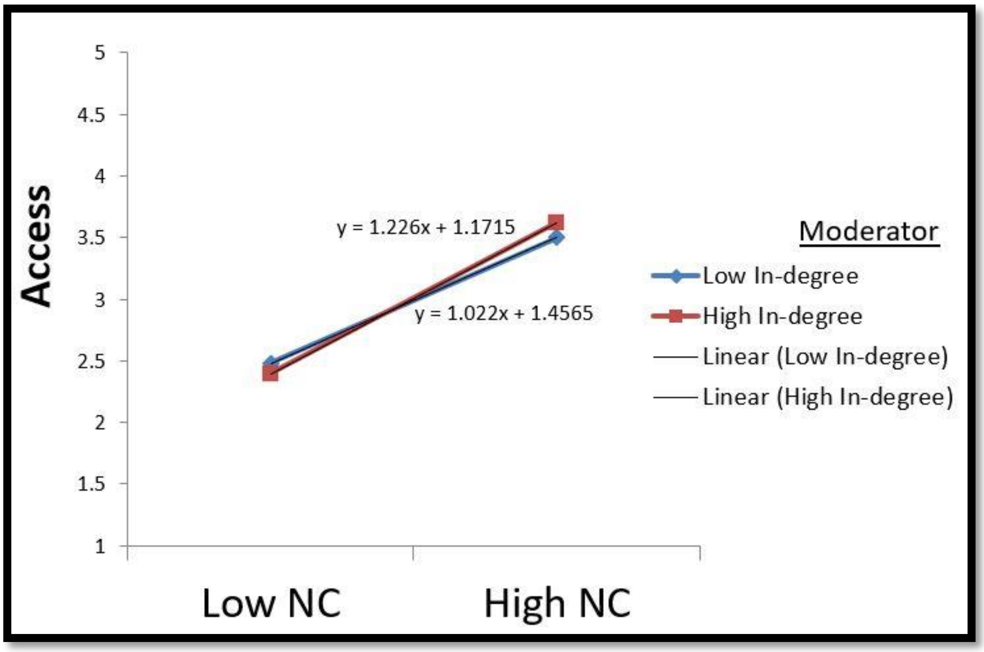
We plotted the moderating effect of in-degree centrality on the networking capability – access relationship in the hospitality business network is in Figure 5.7 using the MS Excel macro tool (Dawson, no date). Table 5.28 shows the unstandardised estimates including the intercept used to plot the interaction effect. As shown in Figures 5.7, in-degree centrality strengthens the positive relationship between networking capability and access in the hospitality business network.

Table 5.28: Unstandardised estimates for regression paths on access – Hospitality business networks (n = 319).

Network	ZNC (Exogenous construct **X**)	ZIn-degree (Moderator **M**)	ZNC_X_ZIndegree (Interaction effect **XM**)
Innovation	0.568	0.013	0.055

Note: ZNC = Standardised networking capability; ZIn-degree = Standardised in-degree centrality.

Figure 5.7: Interaction effect of in-degree centrality on the networking capability-access relationship (hospitality business network).



Note: NC = Networking capability.

The results from the FMCG and hospitality business networks in this sub-section confirm that in-degree centrality positively moderates the relationship between networking capability and access to resources. This positive association increases as in-degree centrality increases, so supporting Hypothesis 3.

5.7.2 Hypothesis 4 – The moderating role of closeness centrality

Hypothesis 4 predicted that closeness centrality would positively moderate the relationship between networking capability and actors` ability to access embedded resources in the business network. It was emphasised that the positive association between networking capability and access increases as closeness centrality increases. However, as shown in Table 5.29, the interaction between closeness centrality and networking capability is not significant in either the FMCG business network or the hospitality business network. Therefore, Hypothesis 4 is not supported in either network.

Table 5.29: Results of structural equation modelling – Closeness centrality – Both business networks.

Regression path	Network	Indirect effect		Result
		Standardised estimates	***t* - value**	
Hypothesis 4: Networking capability_x_Closeness centrality→ Access	FMCG	0.011	0.266	Not Supported
	Hospitality	- 0.051	-1.210	Not Supported

Note: *t* – value significant at: * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

To this end, the results of the moderation analysis show that in-degree centrality strengthens the positive association between networking capability and access to resources. That is to say, higher levels of in-degree centrality results in a more central position in the network, which increases the actor`s ability to access resources. It is the number of inward relationships held by the actors, rather than how close they are to others in the network (i.e., closeness centrality), that enhances the actors' ability to access resources. These findings are discussed in more detail in the following chapter.

5.8 Summary

This chapter has presented and described the procedures from the collection of data up to the hypothesis testing. The data from the survey were examined for missing values and non-response bias, leaving 331 complete surveys from the FMCG business network and 319 from the hospitality business network. SNA was conducted by producing the network position constructs, namely in-degree centrality and closeness centrality, needed for the moderation analysis through SEM. Next, further SNA was conducted in order to give clarity to the CB-SEM results and triangulate the analysis through the lens of social network theory, with the SNA results discussed in the next chapter. In fact, SNA provides the research with the ability to compare the FMCG and hospitality business networks against each other in order to examine sectoral differences. We found this step necessary after generating the business network maps. Interestingly, the two business network maps were visually different to each other, leading to the comparison between the FMCG and hospitality business network structures in the next chapter.

This chapter proceeded with the second phase of quantitative analysis, CB-SEM. The measurement items of all the constructs were subjected to EFA and CFA in order to test for construct reliability and composite reliable, convergent and discriminant validity in order to ensure the quality and robustness of the data analysis. The measurement items showed satisfactory reliability and validity even after the need to drop a number of items (4 out of 29) during EFA. Model fit indices were checked throughout CB-SEM, and all the measurement and structural models for the FMCG and hospitality business networks showed a good model fit. After having established reliability, validity and goodness of fit for the construct it was necessary to accurately and consistently examine the theoretical framework, so the chapter progressed with the hypothesis testing. This was split into two parts. First, we tested the direct effect hypotheses (Hypotheses 1a-d and 2a-d), and in the second part tested the moderation hypotheses (Hypotheses 3 and 4). As shown in this chapter, the majority of the hypotheses were supported by the data, apart from Hypothesis 4.

Drawing upon the findings reported in this chapter, the following chapter proceeds with a detailed discussion of and further elaboration on the findings in relation to the theories on which the current research is based, and compared against the current state of the art. Specifically, the next chapter links the research findings with the research questions and presents how the research findings have answered the research questions and objectives.

Chapter 6. Discussion

The previous chapter (Chapter 5: Data Analysis and Results) presented in detail the results of our empirical analysis conducted to test the research hypotheses. The aim of this chapter is to critically examine the research findings in light of the current state of art outlined in previous chapters, and to make judgments on what has been learned in the research. In more detail, the chapter demonstrates how the research questions have been answered and how the research aims and objectives outlined in Chapter 1 (Introduction) have been achieved. Second, the chapter discusses the research findings and data analysis results, and compares them with those of previous studies. The overarching research question addressed in this study was:

In a business network context, to what extent does networking capability affect the digitalised value co-creation process that results in innovativeness and how does the actors` network position influence this process?

From a theoretical perspective, we draw on the S-D logic perspective (Vargo and Lusch, 2004, 2017) in combination with the DCV of the firm (Helfat *et al.*, 2007; Teece, 2007) and the building blocks of interaction for value co-creation, i.e., the DART model (Prahalad and Ramaswamy, 2004) to examine the technology-enabled value co-creation process, its effect on firm innovativeness, and how networking capability influences this process. Further, we draw on social network theory (Freeman, 1979; Levitt and March, 1988; Wasserman and Faust, 1994) to (i) improve understanding of how actors' network position moderates the relationship between networking capability and access to resources; and (ii) compare how the different structures of the business networks being studied influence actors' ability to access network resources, which in turn impacts firm innovativeness.

As shown in Chapter 5 (Data Analysis and Results), our hypothesised model provided an acceptable fit for the data. The majority of our hypotheses were supported by the data, except for Hypothesis 4, in which the moderation effect of closeness centrality had no significant effect on the relationship between networking capability and access. In the following sections, this chapter relates these findings to the literature on networking capability, value co-creation and business networks.

6.1 The relationship between networking capability and DART

It was only recently that the S-D logic perspective started to recognise the need to expand the comprehension of value co-creation beyond dyadic relationships into business networks (e.g., Ramaswamy and Ozcan, 2018; Vargo, 2018; Mele, Polese and Gummesson, 2019) in the field of marketing, strategic management and innovation research. However, comparatively little is known about the underlying dynamic capability through which actors, either individuals or organisations, engage in the value co-creation process. Therefore, the first research objective of the thesis was to examine the impact of networking capability as a catalyst for innovativeness in a technology-enabled value co-creation process, by proposing networking capability as an antecedent of the technology-enabled value co-creation process. Achieving this research objective allowed us to answer the first research question:

RQ1. How can networking capability be a catalyst for innovativeness through a technology-enabled value co-creation process in a multi-stakeholder business network?

Hypothesis 1 tested the impact of networking capability on the DART model. Specifically, this hypothesis proposed that networking capability would have a positive relationship with the DART model; that is, as networking capability increases, so does dialogue, access, risk/benefit assessment, and transparency. The findings from Hypotheses 1a-d extend the research on the S-D logic perspective and the DCV of the firm and make several contributions to the literature, as discussed in the next chapter.

The following sections discuss in detail the effect of such capability on each component of the DART model, starting with dialogue.

6.1.1 Hypothesis 1a – The effect of networking capability on dialogue

The results of this research show a positive relationship between networking capability and dialogue, at $\beta = 0.403$, $t = 7.995$, $p < 0.01$ for the full structural models of the FMCG and hospitality business networks, at $\beta = 0.391$, $t = 7.567$, $p < 0.001$, as shown in Tables 5.23 and 5.24 respectively. The quantitative analysis of this research, therefore, provides support for the assumptions made in Chapter 3 (Theoretical Framework and Research Hypotheses) and tested in Hypothesis 1a; that is, as networking capability increases, so does the interactive dialogue between actors. The analysis confirms that such capability drives organisations in FMCG and hospitality networks to engage in meaningful dialogue with their stakeholders, aiming to develop innovative goods and services that suit their customers` context. Specific to the FMCG and hospitality business networks, understanding actors` value in the organisation`s offerings through meaningful dialogue makes it possible for the organisation to harness actors` capabilities by managing their diversity and engaging in an active and ongoing dialogue within them.

These findings are consistent with the literature, in that actors who develop their networking capability are more capable than others in managing their relationship portfolio in terms of establishing, maintaining, and terminating relationships with actors in their business network (Mitrega *et al.*, 2017; Fang *et al.*, 2019; McGrath, Medlin and O’Toole, 2019). Consequently, actors who develop their networking capability are more competent in establishing meaningful dialogue with other actors after evaluating their relationship portfolio, and are more capable of enhancing collaborative communication. However, it seems that the influence of networking capability on dialogue is not very substantial; i.e., it explains only 16 per cent of the variance in dialogue in the FMCG business network, and only 15 per cent in the hospitality business network. This raises the issue of how meaningful dialogue can be established during the value co-creation process simply by possessing networking capability. However, dialogue is only one component of the building blocks of interaction for value co-creation, and networking capability is essential to embark on such dialogue. Furthermore, this may be due to the nature of the digital engagement platforms employed by the FMCG and hospitality business networks under study. We argued in several sections of the thesis that hierarchical communications, whether internal or external, with the various actors in the business network are no longer unidimensional, and are increasingly being transformed into a flatter structure. Perhaps digital engagement platforms are designed to ease the level of communication hierarchy, which dilutes the efficiency of networking capability. It can also be argued that the reasons for such a small percentage of variance in dialogue are due to the factors discussed below.

The first of these is the nature of the core value propositions for the final customers and/or clients. For instance, in FMCG business network, the nature of the value propositions (e.g., dairy products, juice, ice-cream, culinary items, breakfast cereals and confectionery) is linked with the risks associated with nutrition (food ingredients), financial risks (e.g., raw material costs), and changes in the needs of the demand side (customers), such as new orientations towards more healthier options or diet trends, which require more central decision-making procedures specific to a particular geographical region or country. Angeles-Martinez *et al.* (2018) and McKinsey and Company (2020) argue that FMCG organisations tend to adapt centralised decision-making and production processes in order to reduce costs by expanding their production; i.e., achieving economies of scale, which results in a centralised decision-making process. In addition, Angeles-Martinez *et al.*'s (2018) study reveals that although FMCG organisations are facing increased pressure from customers to (i) produce eco-friendly products, also known as ‘friendly goods’, by reducing the CO2 emissions associated with supply chain logistics, and (ii) to produce products locally as an alternative to large-scale centralised production. Hierarchical communications, centralised decision-making processes and production are favourable in business networks with (i) relatively small product demand, and/or (ii) which are located in modestly sized regions. Ali, Khalid and Qaiser (2020) also conducted a study in which they investigated how performance inefficiencies related to lead time (e.g., stochastic and long lead teams, delays in processing orders, and delays in transportation) increased the existence of the bullwhip effect. Lee, Padmanabhan and Whang

(2004) describe this effect as *"…..the information transferred in the form of "orders" tends to be distorted and can misguide upstream members in their inventory and production decisions. In particular, the variance of orders may be larger than that of sales, and distortion tends to increase as one moves upstream—a phenomenon termed "bullwhip effect.""* (p. 1875). In their study, Ali, Khalid and Qaiser (2020) investigated two FMCG business networks that offered multi-products and adapt multi-supply chains. The two networks adopted different information sharing and decision-making strategies, the first centralised, and the other decentralised. Based on their results, they claim that although the bullwhip effect still exists and cannot be eliminated in decentralised and centralised networks, it can be reduced significantly in centralised FMCG business networks.

On the other hand, in the hospitality business network, the major issues associated with value propositions pertain to the seasonality of tourism "i.e., the imbalance between supply and demand in a particular tourist destination throughout the year" (Fernández-Morales, Cisneros-Martínez and McCabe, 2016, p. 172) and fluctuating demands (Butler, 1998; Fernández-Morales, Cisneros-Martínez and McCabe, 2016; Fernández-Morales and Cisneros-Martínez, 2018) on the supply side, and the tourists' experience of the tourist destination on the demand side (Frías Jamilena, Polo Peña and Rodríguez Molina, 2017; Zhang *et al.*, 2018). Moreover, the hospitality industry is characterised by complexity and interdependency among various actors who are *"constrained by the social, economic, and political environment in which they operate"* (Palmer and Bejou, 1995, p. 616). Therefore, the actors in a hospitality business network should be aware of the various needs within the network and the constraints of the other actors' environments. In effect, the decision-making process should not be confined to a limited number of actors, as this might delay service delivery.

In fact, Palmer and Bejou acknowledge the critical role of hubs in the hospitality business network, which they refer to as 'conveners' in managing the various relationships and connecting the different clusters together. The SNA results in section 5.4 are in line with Palmer and Bejou (1995) and show that the hospitality business network has more hubs than the FMCG business network, which is a result of network fragmentation (i.e., not all the actors are reachable by others from any point in the network) and indicates that the hubs do indeed intercept the communications and resources in their cluster and act like bridges connecting the different clusters (see Figure 5.3).

The second factor is the institutional arrangements. As acknowledged by Edvardsson *et al.* (2014), Vargo, Wieland and Akaka (2015) and Vargo and Lusch (2016, 2017), 'institutions' (e.g., rules, standards, beliefs, norms, meanings and values), which are also referred to as institutional arrangements, play an important role in value co-creation, as the presence of such agreements assists actors in coordinating service exchange and resource integration among themselves (see Axiom 5, Table 2.3). Similarly, Krackhardt (1995) argues that the presence of institutional arrangements is one of the factors that cause constraints in the network and the absence of some relationships. To emphasise this point, some institutional arrangements might allow an actor to form a relationship with another specific actor, but prohibit them from making relationships with others, or across units, depending on organisational policies. As such, due to such institutional arrangements an actor might not be able to establish dialogue with other actors in the business networks, even though they are connected to each other through the digital engagement platform. Although this reasoning is theoretically true according to the claims of Edvardsson *et al.* (2014), Vargo, Wieland and Akaka (2015) and Vargo and Lusch (2016, 2017), it needs further investigation and empirical justification, which this beyond the scope of this study. Therefore, institutional arrangements are included in the research limitations discussed in the following chapter (i.e., Conclusion).

The following section discusses the impact of networking capability on the second component of the DART model, access to resources.

6.1.2 Hypothesis 1b – The effect of networking capability on access

The results of this research (see Tables 5.23 and 5.24) show a positive relationship between networking capability and access, at $\beta = 0.522$, $t = 11.255$, $p < 0.001$ for the FMCG business network, and at $\beta = 0.643$, $t = 15.074$, $p < 0.001$ for the hospitality business network. It can therefore be concluded that an increase in networking capability does indeed increase actors' access to intangible resources; i.e., monetary, social, mental, physical, technical, knowledge-based, and solutions, and to other resources embedded in the business network through the digital engagement platform. These findings provide support for our assumptions made in Chapter 3 (Theoretical Framework and Research Hypotheses), that as networking capability increases, so does actors' ability to access resources, as tested by Hypothesis 1b. In other words, networking capability drives the organisations in the FMCG and hospitality business networks to grant their stakeholders access to numerous intangible resources. For instance, in the FMCG business network, increased levels of networking capability allow the actors to access information about (i) the market segments in terms of trends, customers` preferences, attitudes and behaviours; (ii) culture, sub-culture and consumption rituals specific to market segments served by the business network; and (iii) information about rivals` activities and competitive offerings, which all influence the marketing and NPD strategies in the FMCG business network. Similarly, in the hospitality business network, information regarding travel destinations, prices, travel packages, discount offers, and other information is available on the digital engagement platform for the various actors in the business network. As a result, actors' access to the intangible resources offers them the advantage of gaining more knowledge and information regarding the value propositions at their disposal. Hence, actors should be aware of how to nurture their networking capability and to create more visibility for the various actors in their business network, as opposed to actors who do not possess or develop such a capability. In effect, networking capability makes actors more noticeable, which consequently opens up new avenues for opportunities.

The findings from Hypothesis 1b are closely in line with the arguments associated with the DCV and the theoretical arguments proposed by Mu and Di Benedetto (2012), Mitrega *et al.* (2017) and Mu *et al.* (2017), on which Hypothesis 1b is based, providing them with statistical support. In fact, our findings are also in line with the suggestions of social capital theory (Coleman, 1988; Nahapiet and Ghoshal, 1998) and social network theory, that the set of interpersonal and inter-organisational relationships possessed by an actor, and the extent to which resource deployment and sharing occur in the business network, provide the actor with greater accessibility to various information and knowledge resources. Such opportunities stemming from interpersonal and inter-organisational relationships, such as connections with reputable actors or those with superior competences and valuable resources, could be a stepping-stone that will provide access to diverse non-redundant network resources, new technological knowledge, and even new markets. Specific to the FMCG and hospitality business networks, the quantitative analysis of this research has proven that this indeed is the case.

Further, it can be seen from Figures 5.4 and 5.5 that (i) networking capability has the strongest impact on access (evenly with risk/benefit assessment) compared to its effect on dialogue and transparency in the FMCG business network, and (ii) networking capability has the strongest impact on access compared to its effect on the rest of the DART model components in the hospitality business network, highlighting its critical role in providing actors with the ability to increase their ability to access valuable network resources. Moreover, Figures 5.4 and 5.5 show that networking capability explains 31 per cent of the variance in access to resources in the FMCG business network, and 43 per cent in the hospitality business network. In order to add more clarity to these results, we discuss the research findings through the lens of social network theory.

As shown in Figures 5.1 and 5.2 (network maps), the shapes of the FMCG business network and hospitality business network maps are different. The hospitality business network looks more ‘linear’ than that of the FMCG. The difference in the network shapes is due to the use of the ForceAtlas2 algorithm. As previously mentioned (see section 4.6.5), ForceAtlas2 places each node in the network depending on its relationships with the other nodes (Jacomy *et al.*, 2014). In particular, it takes into account the geometric distance between two nodes, in this way using the proximities between nodes to express clusters.

Accordingly, as shown in Tables 5.5 and 5.6, the FMCG business network has ten clusters, while the hospitality business network has six. As shown in Table 5.6, in the hospitality business network, the number of actors in each cluster is higher than that in the FMCG business network. Moreover, the clusters in the hospitality business network have a higher density than those in the FMCG business network. Freeman (1979) defines network density as the number of relationships the actor has compared to the total number of relationships in the business network. Table 5.7 shows that the network density for the FMCG and hospitality business networks is 0.015 and 0.016 respectively. It is evident that the network density is relatively lower in the FMCG business network compared to that of the hospitality business network. These results, therefore, reveal that the actors in the FMCG business network tend to develop relationships with actors from outside their own clusters (cross-cluster relationships), which result in low network density. The low density of the FMCG business network denotes that the actors are more capable of accessing novel ideas, new markets and technologies; of identifying opportunities; and have more ability to create new combinations of value than the actors in the hospitality business network. Put differently, actors in the FMCG business network have a higher capability to provide novel ideas and new resources than those in the hospitality business network, which is in accordance with structural holes theory (Burt, 1992), and which, in turn, enhances the FMCG network`s innovativeness. These results are in line with and validate the results of the branch of researchers (e.g., Burt, 1992; Gulati, 1998; Koka and Prescott, 2002; Gilsing and Nooteboom, 2005; Inkpen and Tsang, 2005; Dhanaraj and Parkhe, 2006; Rodrigo-Alarcón *et al.*, 2017; García-Villaverde *et al.*, 2018), who argue that high-density results in redundant relationships, which in turn limits actors' ability to access novel ideas and resources. Consequently, high density inhibits diversity, which is essential for novelty value. Moreover, besides information redundancy, the scholars cited above found that high-density is associated with (i) blindness (i.e., neglecting the opportunities and the diverse resources embedded in the network outside their clusters); (ii) opportunistic behaviour; (iii) the costs of maintaining relationships; and (iv) the risk of undesirable knowledge spillovers, which all discourage overall creativity and innovation performance.

Opposite to the schools of thought mentioned above and in contrast to our findings regarding network density, a stream of research represented by Coleman (1988), Buskens (2002) and Li, Cao and Zhang (2018), proposes that higher levels of network density indicate the high potential for building trust among the actors. In this respect, Gilsing *et al.* (2008) argue that actors in dense networks consider the information obtained from their alters (neighbours in the network) to be richer and more reliable because of trust and triangulation. Triangulation here means *“if A remains linked to both B and C, even if there is also a link between B and C, this may help A to understand C by comparing what A understands from C with what B understands from C”* (Gilsing *et al.*, 2008, p. 1721). As a result, Gilsing *et al.* (2008) argue that network density enhances the absorptive capacity of each actor in the business network. Further, Cohen and Levinthal (1990) argue that observative capability is critical to actors’ innovative capabilities, in that prior related knowledge is essential to recognise, assimilate and apply new knowledge in developing value propositions. In essence, Gilsing *et al.* (2008) argue that this external knowledge is largely contingent on the similarity of the actors` knowledge bases in the same cluster; therefore, high-density is associated with higher levels of absorptive capacity. However, in terms of novelty creation, Gilsing *et al.* (2008) argue that high-density dampens actors’ ability to access novel information. This argument is in line with the first stream of researchers mentioned earlier.

Further, Table 5.7 shows that the average closeness centrality of the actors in the FMCG business network is 0.231, which is higher than that of the actors in the hospitality business network (0.138). This indicates that the actors are closer to each other in the FMCG business network, which, according to Newman (2003), results in a shorter average path length; i.e., the shortest distance between two actors (Watts and Strogatz, 1998; Borgatti, Brass and Halgin, 2014) (see Tables 5.5 and 5.28). Hosseini and Kesler (2013), Ichinose *et al.* (2018) and Muller and Peres (2019) argue that high average closeness centrality, coupled with a short average path length, results in faster transmission of information and resources, which in turn indicates that the business network is structured in a way that increases its efficiency. In essence, due to the high average closeness centrality and short average path length in the FMCG business network, the actors transmit information and integrate resources more rapidly than their counterparts in the hospitality business network.

Based on the above discussion, it can be argued that although the positive association between networking capability and access is proven to be statistically stronger in the hospitality business network compared to the FMCG business network, in that the actors in the hospitality business network can access a greater number of tangible resources than those in the FMCG business network, the resources accessed in the latter, according to the structural holes theory (Burt, 1992), are more novel. This is due to the network structure of the FMCG business network.

The following section presents a discussion of the impact of networking capability on the risk/benefit assessment, the third component of the DART model.

6.1.3 Hypothesis 1c – The effect of networking capability on risk/benefit assessment

As shown in Tables 5.23 and 5.24, the results of this research indicate a positive relationship in the full structural model of the FMCG business network between networking capability and risk/benefit assessment, at $\beta = 0.522$, $t = 11.117$, $p < 0.01$, and $\beta = 0.514$, $t = 10.680$, $p < 0.01$ for the hospitality business network. The quantitative analysis of this research, therefore, provides support for the assumption that as networking capability increases, so does the actors' tendency to make risk/benefit assessment, as discussed in Chapter 3 (Theoretical Framework and Research Hypotheses) and tested in Hypothesis 1c. Based on these results, we argue that having open and transparent access to confidential and important information about the actors` offerings and competences builds trust among the collaborative parties, as argued previously by Zaheer, McEvily and Perrone (1998), Prahalad and Ramaswamy (2004), Walter, Auer and Ritter (2006) and Baumann and Le Meunier-FitzHugh (2014). Specific to the FMCG and hospitality business network contexts, we add to the debate in the above studies on whether trust among the collaborative actors due to networking capability (i) reduces the formal procedures undertaken by them, as risk assessment simplifies the risk/benefit assessment process when an actor monitors other actors' behaviour; and (ii) the benefits gained from the relationship are greater than the perceived risks due to the fact that networking capability allows the actors to gain comprehensive insight of other actors before building relationships. In other words, the willingness to invest in collaborative relationships among actors reduces the perceived risks of the collaborations.

The findings of Hypothesis 1c are in line with the literature, that networking capability plays a critical role in providing actors with the ability to first evaluate and select with which actors they should build or maintain relationships, depending on their assessment of the capabilities and competences on offer (Mitrega *et al.*, 2012). Second, it allows them to mitigate the risks and reduce the costs associated with internally refining and developing resources (Srivastava and Gnyawali, 2011). Third, it encourages the building and maintaining of relationships with well-known and reliable actors, which in turn reinforces their reputation in the business network and makes them more attractive for the building of relationships (Ahuja, 2000b; McEvily and Marcus, 2005), subsequently increasing the pace and reducing the time and effort the actors might normally spend in searching for new actors with whom to collaborate. Finally, it recognises the changing dynamics of actors` needs, which increases their ability to assess and cope with changes (Chaudhuri, Mohanty and Singh, 2013).

As can be seen from the results shown in Tables 5.23 and 5.24, the variance in risk/benefit assessment explained by networking capability is 27 per cent in the FMCG business network, and 26 per cent in the hospitality business network, which are very similar figures. These findings suggest that networking capability has relatively equal importance in increasing risk/benefit assessment in both business networks. This can be due to the fact that the FMCG and hospitality business networks consist of multiple actors who possess a variety of resources, competences and capabilities that cannot be found in one individual actor. Since these actors are present in the digital engagement platform, the challenge is to bring these diverse resources and competences together by exploring new relationships and exploiting existing ones. This ambidexterity of the relationships in the business network is inevitable; just as they are associated with benefits, they are not free of risks. Since the actors in the FMCG and hospitality business networks possess such networking capability, networking capability makes it possible for the actors in both business networks to make a detailed and critical evaluation of what other actors of interest can bring to the table, and of the potential risks associated with such relationships. We highlighted the risks associated with the FMCG and hospitality business networks` offerings in section 6.1.1. These risks include, but are not confined to, (i) economic uncertainty, raw material costs, and the risks associated with nutrition and changes in customer`s consumption attitude in relation to the FMCG network; and (ii) fluctuating demand and under-utilised assets in relation to the hospitality network.

Ultimately, in the FMCG and hospitality business networks, networking capability will enhance actors' ability to minimise the effort, time, and money spent on developing in-house resources, as well as to assess the associated risks of inter-organisational relationships on the objectives sought from any collaborative association. This is in line with the DCV of the firm suggestion that organisations should develop abilities that allow them to mitigate uncertainty and diminish the impact of environmental dynamics (Helfat, 2007; Helfat and Raubitschek, 2018). In fact, as argued by Zsidisin *et al.* (2004), actors have legal obligations to identify the risks associated with their operations and related consequences for stakeholders. When actors decide to engage in the value co-creation process, networking capability is essential so that they have the ability to effectively identify and address the risks associated with the process. Hence, improved network capability will result in an enhancement of risk/benefit assessment as a part of the value co-creation process.

Finally, the next section discusses the impact of networking capability on the last component of the DART model, transparency.

6.1.4 Hypothesis 1d – The effect of networking capability on transparency

As shown in Tables 5.23 and 5.24, the study results prove that there is a positive relationship between networking capability and transparency in the full structural model of the FMCG business network, at $\beta = 0.388$, $t = 7.648$, $p < 0.001$, and $\beta = 0.366$, $t = 7.017$, $p < 0.001$ for the hospitality business network. These results suggest that by developing networking capability, actors are more able to counter issues related to information asymmetry, opportunistic behaviour and role conflicts by managing the interpersonal and inter-organisational relationships. The ability to manage the relationships with diverse actors in the FMCG and hospitality business networks enhances the building of mutual understanding of the explicit roles of each actor, and a suitable climate for the collaborative relationships, which in turn induces openness and information symmetry among the actors.

As emphasised in the IS and value co-creation literature, actors nowadays have access to more information and are exposed to new knowledge more than ever, which results in empowered actors with higher awareness of the organisation`s activities (Lusch and Nambisan, 2015; Nambisan *et al.*, 2017). Despite the fact that transparency and information symmetry between customers and the organisation is an element of value co-creation, previous studies (e.g., Prahalad and Ramaswamy, 2004) reveal that organisations have traditionally opposed openness and transparency as they may carry an element of risk. The reason for this might be (i) the fear of leaking crucial and valuable information by the customers (Garcia Martinez, 2014), and (ii) legal and privacy issues concerning intellectual property, patents, ownership of resources and copyright regarding goods and services innovations might arise in association with value co-creation (Füller *et al.*, 2006; Wong *et al.*, 2016). In essence, Nambisan (2002), together with Wong *et al.* (2016), posits that although transparency is crucial for value co-creation, higher levels of transparency in the process might dampen the organisation`s competitiveness, as competitors may gain access to crucial and/or confidential information regarding product development processes and ideas. Similarly, Vaccaro and Patiño Echeverri (2010) argue that *"higher awareness may lead to lower perceived transparency"* (p.490). Contrary to these schools of thought, our results reveal that networking capability has a positive impact on transparency among actors in the FMCG and hospitality business networks. The actors in both networks engage in collaborative relationships, which drive them to be more transparent about their capabilities and competences, aiming for better resource integration through such interaction. In fact, interactions among actors *"must start from access and transparency"* (Prahalad and Ramaswamy, 2004, p. 13), which means resource integration cannot happen in the absence of access to resources and transparency among actors.

These findings also empirically validate the theoretical assumptions made in previous work by scholars such as Mu and Di Benedetto (2012), Pérez and Cambra-Fierro (2015) and Mitrega *et al.* (2017) on the impact of managing the relationship portfolio and networking capability on creating more openness and information symmetry, which diminishes the propensity for role conflicts, powerplay and opportunistic behaviour. Moreover, these findings contribute to the debate initiated by Chowdhury, Gruber and Zolkiewski (2016) in their study of *"the dark side of value co-creation in B2B service networks"*, that although the S-D logic perspective supports the significance of transparency among actors, it fails to clarify how it can actually occur in practice in the context of business networks, where diverse strategic goals and objectives exist. In effect, Chowdhury, Gruber and Zolkiewski (2016) propose that the issues related to a lack of transparency, such as *"role conflicts, role ambiguity, weak-form opportunism, and power plays"* (p. 101), are inevitable and are in fact exacerbated during the value co-creation process in the context of business networks. In contrast to Chowdhury, Gruber and Zolkiewski's (2016) proposition, our results reveal that transparency can be increased and that the issues of role conflicts, role ambiguity, weak-form opportunism and power plays can be mitigated by developing and increasing the investment in networking capability. As such, these results provide a more realistic approach to how networking capability can enhance the value co-creation process in practice by positively influencing the components of the DART model.

Based on the above discussion, in order to increase transparency among the actors in the FMCG and hospitality business networks within the digital engagement platform, the development of networking capability is essential. Increased levels of networking capability help to develop trust among actors through interpersonal and inter-organisational relationships. In this sense, networking capability increases the propensity for sharing information, knowledge, skills, expertise and resources, which in turn increases actors' willingness to be more transparent and to engage in the value co-creation process by integrating their resources within the business network.

To this end, the first research question posed by the thesis has primarily been answered by the quantitative investigation undertaken using CB-SEM, with more insights being provided by SNA. This combination of SEM and SNA has provided rich insights and greater understanding of the results of Hypotheses 1a-d. Specifically, it has allowed an in-depth conclusion to be drawn about the value co-creation process in the context of business networks. Subsequently, it has pointed to under-researched constructs (e.g., centrality measures and institutional arrangements) that require more investigation in order to fully understand networking capability as an antecedent of the value co-creation process in a multi-stakeholder business network.

After discussing how networking capability is a critical antecedent of the value co-creation process, the impact of the technology-enabled value co-creation process on firm innovativeness was investigated, shedding light on how networking capability can be a catalyst for firm innovativeness through the DART model. The following sections discuss in detail the impact of each component of the DART model on firm innovativeness.

6.2 The relationship between DART and firm innovativeness

To date, most research on value co-creation has been conceptual, with only a few studies examining the value co-creation process using qualitative methodology aimed at contributing to the development of the S-D logic perspective into a theory. Nevertheless, our literature review, together with recent meta-analyses by Aarikka-Stenroos and Ritala (2017) and Li *et al.* (2020), reveal that current research on value co-creation remains confined to dyadic relationships, despite the recent developments in the S-D logic perspective and the urgent call by its founders, Vargo and Lusch (2017), together with other scholars, to (i) expand this perspective into the ecosystem/network setting; and (ii) provide a theoretical framework that accommodates the value co-creation process among multiple actors in digital engagement platforms (Lusch and Nambisan, 2015; Ramaswamy and Ozcan, 2018a; Hein *et al.*, 2019). We emphasised in Chapter 1 (Introduction) and in section 6.1 that this thesis aimed to contribute to the S-D logic perspective and the value co-creation literature by extending the DART model beyond dyads into business networks by following several steps. The first was the incorporation of networking capability as a critical antecedent of the technology-enabled value co-creation process. Networking capability was statistically proven to be an antecedent to the process and positively impacts all the DART model components (Hypotheses 1a-d). The second step, which was one of this thesis research aims, was to examine the impact of the DART model on firm innovativeness as a value-based outcome of the proposed expanded technology-enabled value co-creation process framework. The purpose of setting this aim was to answer the second research question:

RQ2. To what extent does the DART model affect firm innovativeness?

According to the results of the data analysis (see Figures 5.1 and 5.2), the DART model is a strong predictor of firm innovativeness, explaining 46 per cent and 47 per cent of the variance in firm innovativeness in the FMCG and hospitality business networks respectively. These findings suggest that in order to enhance firm innovativeness in a business network, actors should adopt and employ the DART model in their digital engagement platform. The following sections discuss in detail the effect of each component of the DART model on firm innovativeness, starting with the impact of dialogue, the first component of the model, on firm innovativeness.

6.2.1 Hypothesis 2a – The effect of dialogue on firm innovativeness

Hypothesis 2a focused on the direct effect of dialogue between the actors in the business network, as enabled by the engagement digital engagement platform, on firm innovativeness. In this research, it was hypothesised in Chapter 3 (Theoretical Framework and Research Hypotheses) that an increased level of dialogue would have a positive effect on firm innovativeness; i.e., the more open and interactive the dialogue between the business network`s actors, the more likely that they would become more innovative. The quantitative analysis of the research demonstrates that this is indeed the case, therefore providing support for the assumptions made and tested in Hypothesis 2a. Specifically, the results of this research show that dialogue has the second strongest positive effect on firm innovativeness, at β = 0.253, t = 5.650, p < 0.001 for the FMCG business network and β = 0.240, t = 4.862, p < 0.001 for the hospitality business network for the full structural models of both business networks (see Tables 5.23 and 5.24). These results confirm that the FMCG and hospitality business networks engage in interactive dialogue using the digital engagement platforms with both internal actors from within their organisations and external ones from outside them, but who are within their business network, as implied in the survey questions (Appendix 9). Through dialogue, the actors in the FMCG and hospitality business networks are able to contribute their input (e.g., knowledge, skills and information), as well as their views about value, into the value co-creation process. As a result, this develops a superior value proposition relevant to customers` needs and wants in the target markets (Frow *et al.*, 2015), and consequently enhances the organisation`s innovativeness.

Further, the findings from the FMCG and hospitality business networks indicate that aspirations and novel ideas are often extracted from external actors within the network. Firm innovativeness is significantly enhanced by the relationships` actors have built with other actors in their business network. In one way or another, they might face a lack of available resources which are crucial for their business operations and the development of value propositions. However, the digital engagement platforms employed by the business networks under study serve as avenues used by the actors as a means of interactive communication, to share and integrate their operant resources and increase their exposure to innovation opportunities. The dialogue facilitated by digital engagement platforms provides assurance for the actors regarding the anticipated risks associated with NPD and NSD activities. It first allowing them to be less concerned about taking risks when engaging in innovative activities, in the knowledge that the resources they can access, share and integrate with the other actors in the value co-creation process will protect them from losses due to NPD and NSD failures if these are developed without collaboration. Put differently, the value co-creation process not only provides the actors with mutual benefits, but also allows them to share the risks of innovative activities in case of failure. This can be achieved through meaningful dialogue that allows the actors to reach a common understanding of what is needed for a successful value proposition development and to construct common strategic goals. Second, through dialogue, the actors in the FMCG and hospitality business networks are able to disclose innovation opportunities and detect the available resources within their own networks. This in turn allows them to devote more time to NPD and NSD rather than making the effort to secure the resources required for their survival and success. In essence, for the value co-creation process to produce value-based outcomes such as firm innovativeness, facilitating dialogue for the actors through the digital engagement platform is necessary to effectively integrate resources and generate new ideas and innovation opportunities.

These findings are in line with the notions of the theory of channel communication (Mohr and Nevin, 1990), that dialogue between actors enhances the outcomes of the collaborative effort, i.e., firm innovativeness in this research, by creating symmetrical power conditions. These conditions stem from the fact that dialogue between actors facilitates the generation of new ideas and access to new knowledge internally; i.e., within the organisation, and externally within the business network (Ballantyne, 2004; Ayuso, Rodríguez and Ricart, 2006). Moreover, the results are also consistent with the theory of action (Coleman, 1978) and the literature on value co-creation (Prahalad and Ramaswamy, 2004), which suggest that deep engagement and lively activity among actors through dialogue make them aware of the innovation opportunities available, together with the threats. In addition, they are able to recognise the capabilities and competences of business partners, and the entailing restrictions and limitations, thus providing timely engagement in the value co-creation process. These findings validate our argument that dialogue between the actors within the digital engagement platform creates an instant knowledge-sharing mechanism among internal (e.g., employees) and external (e.g., business partners) parties, allowing the engaged actors to construct common meanings and build a clear picture of their capabilities and competences, all of which are required to develop more innovative value propositions.

The following section discusses the impact of the second component of the DART model, access to resources on firm innovativeness.

6.2.2 Hypothesis 2b – The effect of access on firm innovativeness

Hypothesis 2b focused on the direct effect of access to embedded resources in the business network on firm innovativeness. In this research, it was hypothesised in Chapter 3 (Theoretical Framework and Research Hypotheses) that an increased level of access to embedded resources in the business network would have a positive effect on firm innovativeness; i.e., the more resources the actors can access through the digital engagement platform, the more likelihood of them becoming more innovative.

As shown in Tables 5.23 and 5.24, the results indicate a positive relationship between access and firm innovativeness, at $\beta = 0.107$, $t = 2.221$, $p < 0.05$ for the FMCG business network, and $\beta = 0.134$, $t = 2.417$, $p < 0.05$ for the hospitality business network. These results are in line with the theoretical emphasis of previous studies (e.g., Amara and Landry, 2005; Nieto and Santamaría, 2007; Vega-Jurado *et al.*, 2008; Ozdemir *et al.*, 2020), that increased access to resources will enhance innovativeness. However, as shown in Figures 5.1 and 5.2, although 'access' has a positive and significant impact on firm innovativeness, the association between access and firm innovativeness is the weakest among the remaining DART model components in both business networks. This highlights the importance of the DART model as a whole in increasing firm innovativeness, as mere access to embedded resources in the business network is not sufficient. Hence, the importance of the value co-creation process as an integrated process to improve firm innovativeness. Since access to resources-innovativeness is at the core of social network theory assumptions, we interpret the results of Hypothesis 2b through SNA by comparing the two network typologies with each other to better understand the CB-SEM results, as discussed below.

We outlined previously in section 4.6.5 that when comparing two directed networks, Hansen, Shneiderman and Smith (2011) and Hosseini and Kesler (2013) recommend the use of overall network metrics, including (i) network diameter, i.e., *"the length (in number of edges) of the longest geodesic path between any two vertices"* (Newman, 2003, p. 5) and (ii) small-world parameters, especially the average path length and the average clustering coefficient. Hosseini and Kesler (2013) define the clustering coefficient of a node as the *"measure of the number of edges that exist between its nearest neighbours"* (p. 7). First, as shown in Table 5.8, the network diameter in the FMCG business network is 11, while in the hospitality business network it is 22. As noted previously (see section 4.6.5), the network diameter shows how many steps are required by the actor to cross from one side of the network to the other (Wasserman and Faust, 1994). In the FMCG business network, the network diameter indicates that each actor is separated from other actors by 11 steps, while in the hospitality business network the corresponding diameter is 22 steps. Consequently, the low network diameters in the FMCG business network compared to those in the hospitality business networks indicate that the resources (e.g., information) in the FMCG business network travel more rapidly to all the actors in the networks.

Second, as shown in Table 5.8, in the FMCG and hospitality business networks, the values for connectedness are 1 and 0.969 respectively, while the fragmentation for both business networks is 0 and 0.031 respectively. These results reveal that the values of connectedness and fragmentation of the FMCG business network denote that all the actors are connected to each other, and that this connection will remain if any of the actors are removed. Therefore, an actor cannot impede the information flow from reaching any other actor; that is, all the actors are embedded in the same structure (Borgatti, 2003). On the other hand, in the hospitality business network, the proportion of connected actors that will remain reachable if an actor is removed from the network is only 3.1 per cent. This indicates that the hospitality business network is less cohesive than its FMCG counterpart due to the existence of a few dominant relationships probably governed by brokers (connectors) or hubs, which may impede the information flow within the network.

Finally, the small-world properties, i.e., the average path length and average clustering coefficient, provide an informative indication of how well the network is structured for rapid transmission and configurations of resources (Hosseini and Kesler, 2013). As shown in Table 5.8, the FMCG business network has a higher average clustering coefficient of 0.100 than the hospitality business network, whose average clustering coefficient is 0.088. Furthermore, as shown in Table 5.26, the FMCG business network has a shorter average path length of 4.446, compared to its counterpart in the hospitality business network, which is 7.412. Moreover, the FMCG business network has a higher small-world index of 5.749, compared to that of the hospitality business network, which is 3.217. These findings are in line with Watts and Strogatz's (1998) and Borgatti, Brass and Halgin's (2014) argument that the average path length is typically short in small-world networks. Specifically, these authors argue that the average path length measures the efficiency of information transmission in the network; that is, a shorter average path length denotes faster information transmission (Ichinose *et al.*, 2018; Muller and Peres, 2019), while the average clustering coefficient measures the transitivity of the network - the degree to which it is connected (Watts and Strogatz, 1998; Borgatti, Brass and Halgin, 2014).

It is therefore evident that the actors in the hospitality business network do not tend to create tightly interconnected clusters, while in the corresponding FMCG network they tend to build more relationships between the different clusters in the network, as argued in section 6.1.2. This can be visualised in the business network maps (Figures 5.1, 5.2 and 5.3), in which it is clear that few actors in the hospitality business networks act as brokers between the clusters, while in FMCG there are more connections between the clusters, hence lower average path lengths. Moreover, the small-world index is a useful indicator of how the network can be rewired for faster and more efficient resource flow (Watts and Strogatz, 1998; Kleinberg, 2001;

Newman, 2003). As shown in Table 5.26, the high small-world index value for the FMCG business network denotes that the actors are capable of transmitting information within the network more efficiently than in the hospitality business network.

The results indicate that even though the differences between the network visualisations of the FMCG and hospitality business networks are significant, the architectural differences are not very striking between the two networks. The use of digital engagement platforms has made it possible for the FMCG and hospitality business networks to rewire their networks, thus achieving small-worldness. In effect, most of the actors in the networks are connected by a short path through it (Newman, 2003), promoting cooperation and faster information flow (Watts and Strogatz, 1998; Muller and Peres, 2019). However, faster transmission of resources does not necessarily indicate their uniqueness and novelty, which could contribute to firm innovativeness. To emphasise this point, the SNA results revealed that resources travel faster in the FMCG business network because of (i) the shorter network diameter; (ii) the higher small-world index of 5.749, and (iii) the fact that all the actors are connected to each other (i.e., a connectedness value of 1). Taking the results of CB-SEM into consideration, i.e., the impact of access on firm innovativeness in the FMCG and hospitality business networks, this means that (i) the longer steps undertaken by the actors to reach each other (22) in fact allows them to be exposed to more novel ideas and resources compared to the 11 steps taken by the FMCG business network actors; and (ii) resources lose their uniqueness and some kinds of technology spillovers and resource drains might occur because all the actors in the FMCG business network can access the network resources compared to the actors in hospitality business network. These resource drains and potential opportunistic behaviour that hinder the effectiveness of firm innovativeness are mitigated to some extent in the hospitality business network due to the presence of hubs, which evidently make better risk/benefit assessment and establish safeguarding parameters, as discussed in the following section. These findings further support our argument that the digital engagement platform should indeed take into consideration all the DART model components.

The following section discusses the impact of risk/benefit assessment, the third component of the DART model, on firm innovativeness.

6.2.3 Hypothesis 2c – The effect of risk/benefit assessment on firm innovativeness

Hypothesis 2c tested the impact of actors' ability to perform risk/benefit assessment on firm innovativeness. Specifically, this hypothesis proposed that such assessment would have a positive relationship with firm innovativeness; i.e., that as actors' ability to make risk/benefit assessment increases, so does firm innovativeness.

As can be observed in Tables 5.23 and 5.24, the results of this research show a positive relationship between risk/benefit assessment and firm innovativeness in the FMCG business network, at $\beta = 0.120$, $t = 2.679$, $p < 0.01$ and $\beta = 0.144$, $t = 3.078$, $p < 0.01$ for the hospitality business network. The quantitative analysis of this research, therefore, provides support for the assumptions made in Chapter 3 (Theoretical Framework and Research Hypotheses) and tested in Hypothesis 2c. The results, therefore, confirm that the increase in risk/benefit assessment facilitated by the digital engagement platform does indeed increase firm innovativeness. These findings imply that the risk/benefit assessment enabled by a digital engagement platform provides the actors in the FMCG and hospitality business networks with more clarity about returns, and aids in building consciousness, which lowers the perceived risks of resources integration. The empirical analysis also confirms that risk/benefit assessment will increase the ability of actors with strong internal capabilities to break free from the "competency traps", i.e., *"When a firm is unwilling to identify and leverage external knowledge, the potential of internal capability remains underutilized"* (Srivastava and Gnyawali, 2011, p. 800).

There is no doubt that innovations contain levels of risk and uncertainty, coupled with the fact that the actors in the business network are not isolated, and in the empirical settings of this research are gathered together in a digital engagement platform. If the digital engagement platform does not offer the engaged actors the ability to perform risk/benefit assessment during the value co-creation process, this, in turn, might hinder the collaborative effort to increase firm innovativeness and the network ability to produce more innovative value propositions. Specifically, if risk/benefit assessment is not made, actors will remain concerned about knowledge leakage, technology spillovers and resources drains. By definition, value co-creation is a synergetic process which should ideally result in mutual benefits (Vargo and Lusch, 2017); as such, risk/benefit assessment requires actors to inform the parties engaged in the value co-creation process about (i) their knowledge and capability limitations; (ii) the potential risks of the value propositions offered ;and (iii) changes in the dynamics of the markets and other actors' needs in the business network (Prahalad and Ramaswamy, 2004; Taghizadeh *et al.*, 2016). In fact, this is evident from the SNA results from section 5.4 discussed in sections 6.1.2 and 6.2.2. Specifically, these demonstrate that there is a delay in transmitting resources in the hospitality business network due to (i) the longer average path length of 7.412; (ii) the lower small-world index of 3.217; and (iii) the presence of hubs in the network, which result in a connectedness value of 0.969, compared to those of 4.446, 5.749 and 1 respectively for the same network measures in the FMCG business network. These results suggest that the slower transmission of resources in the hospitality business network because of their interception by the hubs implies that mere access to resources by all the actors is not always of benefit in increasing firm innovativeness. Safeguarding procedures should be in place to manage such resources, especially innovative ideas and technologies, and protect them from unethical or opportunistic behaviour. Although we stress the existence of risk mitigation and safeguarding procedures in the digital platform, they should not be complicated in order to lead to a more effective value co-creation process.

Therefore, based on the above discussion, we argue that the collaborative effort in the value co-creation process increases the actors' ability to make better risk/benefit assessment by (i) simplifying the procedures and the safeguarding parameters among the collaborative actors (Sako and Helper, 1998); (ii) collecting actors' feedback on the integrated resources; (iii) understanding the changes in network actors` demands, needs and wants; and (iv) realising that risk/benefit assessment can serve as a learning process for organisations in relation to the threats and unanticipated opportunities manifested in the business network, which overall increases firm innovativeness.

By and large, the results of Hypothesis 2c are in accordance with the studies by Prahalad and Ramaswamy (2004), Romero and Molina (2011) and Srivastava and Gnyawali (2011). In general, these scholars acknowledge that digital engagement platforms provide ubiquitous connectivity that allows the actors to effectively perform risk/benefit assessments of inter-organisational relationships and network resources that can be accessed through the platform. This risk/benefit assessment facilitated through the digital engagement platform will first allow actors whose internal resources may be insufficient and/or inappropriate to enhance their innovativeness and develop their value propositions, by assessing what they need and what they can contribute to mitigating for such insufficiency. Second, it assists actors with strong internal capabilities to integrate their resources with those of other actors, since typically, as argued by Srivastava and Gnyawali (2011), actors with strong internal capabilities might be reluctant to accept foreign 'external' capabilities as they are not familiar with them, and therefore be less willing to engage in innovations. Hence, risk/benefit assessment provides actors with strong internal capabilities with the assurance that the integrated resources and capabilities are appropriate, thus clearing the ambiguity surrounding external resources, and increasing their appetite for innovation.

Finally, the next section discusses the impact of the last component of the DART model, transparency, on firm innovativeness.

6.2.4 Hypothesis 2d – The effect of transparency on firm innovativeness

Hypothesis 2d tested the impact of transparency among the actors engaged in the value co-creation process on firm innovativeness. Specifically, the hypothesis posited that transparency would have a positive relationship with firm innovativeness; i.e., that as the transparency among actors increases, so does firm innovativeness.

The results of this research (see Tables 5.23 and 5.24) show a positive relationship between transparency and firm innovativeness, at $\beta = 0.484$, $t = 11.605$, $p < 0.001$ for the FMCG business network and $\beta = 0.463$, $t = 10.948$, $p < 0.001$ for the hospitality business network, for the full structural models. These results suggest that actors` transparency regarding their capabilities, resources, the risks associated with their value propositions, and the sharing of symmetrical information with other actors is a critical driver for firm innovativeness. To underline this argument, openness and information symmetry among the actors in the FMCG and hospitality business networks regarding the strengths, limitations and constraints pertaining to the resources they possess (e.g., capabilities, competences, financial resources, technology and market intelligence) and their businesses activities (e.g., financial statements, internal process, pricing, product design and service procedure) is indeed a feasible strategy for acting upon opportunities and mitigating risks in order to improve firm innovativeness. Based on the results of hypothesis 2d, we argue that transparency has a double-edged effect; it not only allows the actors to clarify the hidden risks, obstacles, resource limitations and constraints related to the abilities associated with the value propositions in the early stages of their development, but it also bestows trustworthiness upon collaborative interactions, paving the way for the actors to discover and recognise the hidden knowledge, ideas, expertise and true potential of the resources embedded within the business network.

Although Prahalad and Ramaswamy (2004) assert that dialogue is the most significant element of DART during the value co-creation process, the results of this study show otherwise. For the FMCG and hospitality business networks, it can be seen from Figures 5.4 and 5.5 that transparency has the strongest impact on firm innovativeness compared to the effects of the other DART model components, highlighting the critical role of transparency in boosting firm innovativeness. The strong relationship is perhaps due to the fact that transparency generates trust among the actors (Laursen and Salter, 2006; Ramaswamy and Gouvillart, 2010), which endorses the tendency to share critical information and new ideas without the fear of exploitation. The findings of this research, therefore, prove that transparency is the key ingredient within the DART model for the technology-enabled value co-creation process in fostering firm innovativeness in business networks.

The findings of the statistical analysis of Hypothesis 2d are in line with previous work by Zhong (2018), who examined the impact of transparency, specifically that regarding financial statements, on firm innovativeness from the accounting discipline point of view. Zhong`s (2018) study reveals that being transparent in financial statements and internal practices facilitates actors' ability to better allocate R&D capital in order to invest in innovation opportunities. While the findings of Zhong (2018) were based on specific forms of transparency, i.e., financial statements and managerial practices, our findings cover more comprehensive aspects of transparency, namely openness and information symmetry, regarding all the relevant resources required for the development of value propositions by the variety of actors in business network settings. Furthermore, our findings validate previous theoretical assumptions made by several scholars such as Lusch and Nambisan (2015), Blaschke *et al.* (2019), Frey, Trenz and Veit (2019) and Hein *et al.* (2019), that digital engagement platforms should provide actors with the ability to be transparent in order to increase firm innovativeness and innovation performance as a whole.

Taking Hypotheses 1a-d and Hypotheses 2a-d together, the findings indicate that organisations in both the FMCG and hospitality business networks should develop networking capability to successfully engage in the value co-creation process. Moreover, the technology-enabled value co-creation process determines firms` level of innovativeness in business networks. Hence, it is crucial for the digital engagement platform employed by the business network to enable all the DART model components. Networking capability positions actors at the core of the marketing effort, and thus transforms their passive role into an active one in the value co-creation process, which in turn results in enhancing firm innovativeness.

After discussing how networking capability is a critical antecedent of the value co-creation process enabled by a digital engagement platform, and how this process amplifies firm innovativeness, in answering RQ1 and RQ2, the research has investigated the moderating effect of network position on the networking-access relationship. The following sections discuss the moderation analysis results from Chapter 5 (Data Analysis and Results).

6.3 The moderation effect of network position on networking capability-access relationship

In this thesis, one of the main objectives was to examine the possible moderation effect of actors` network position on the networking capability-access to resources relationship. This was because of the lack of literature on the impacts of certain centrality measures and network structure constructs in S-D logic perspective-based research (e.g., Laud *et al.*, 2015; Mele, Sebastiani and Corsaro, 2019), which are particularly relevant to the multi-stakeholder business network context of value co-creation. Therefore, this study has devoted much attention to this gap in the existing literature on network-based research in the context of value co-creation in an attempt to uncover the underlying effects of network position on the value co-creation process and firm innovativeness. In essence, one of the research aims was to improve understanding of how actors' network position influences the networking capability-access relationship. Achieving this aim allowed us to answer the third research question:

RQ3. How does actors' network position (in-degree and closeness centrality) moderate the relationship between networking capability and their ability to access embedded resources in the business network?

Hypotheses 3 and 4 aimed to answer RQ3 by testing the moderating effect of network position on the relationship between networking capability and access to embedded resources in the business network. The argument was that a more central network position would increase the strength of the hypothesised effect between networking capability and access (tested in Hypothesis 1b). Hypotheses 3 and 4 arose from the idea that whilst developing the networking capability of actors is essential for increasing their ability to access business network resources, so is the position occupied by them in the business network. Put differently, the strength of having a more central network position, thus further embedding the actors in their business network, was suggested to cause this moderation. The following sections discuss the results of the statistical analysis for Hypotheses 3 and 4 made in section 5.7.

6.3.1 Hypothesis 3 – In-degree centrality moderates the relationship between networking capability and access

Hypothesis 3 tested the moderating effect of in-degree centrality on the relationship between networking capability and access, which is one component of the DART model. The argument was that the positive association between networking capability and access to resources strengthens as in-degree centrality increases. Note here that in-degree centrality denotes the number of relationships directed inwards towards the actor (Sparrowe *et al.*, 2001). The results of this research show statistical support through SEM analysis for Hypothesis 3 in both the FMCG and hospitality business networks, at $\beta = 0.157$, $t = 3.627$, $p < 0.001$ and $\beta = 0.093$, $t = 2.497$, $p < 0.05$ respectively, as shown in Tables 5.25 and 5.27. This implies that in this case actors` network position in the FMCG and hospitality business networks facilitates the reach of novel ideas through structural holes (see Figure 2.1) and from resources through strong (direct) and weak (indirect) ties.

Figures 5.6 and 5.7 depict the moderating effect posed by Hypothesis 3, indicated by the two crossed lines; the blue line represents low in-degree centrality, while the red one represents high in-degree centrality. The figures show that low and high in-degree centrality have a positive effect on the networking capability-access relationship; however, this positive association is stronger with high in-degree centrality than low in-degree centrality. Specifically, the interaction equation shown in Figure 5.6 indicates that the networking capability-access relationship is 45.6 per cent stronger for actors in the FMCG business network who have higher in-degree centrality, compared to those with a lower level of in-degree centrality. The same pattern can be seen in Figure 5.7 for the hospitality business network, where the networking capability-access relationship is slightly stronger (20 per cent) for the actors with high levels of in-degree centrality compared to those with a lower level. These findings confirm that actors` network position in the FMCG and hospitality business networks in terms of in-degree centrality is a critical factor in fostering the value co-creation process by strengthening actors` ability to access embedded resources in the network. These findings also further support our claim that the inclusion of network position in the all-encompassing framework for the value co-creation process in business networks proposed by the thesis contributes to the expansion of the DART model, which was previously confined to dyadic relationships. This contribution in itself is a unique addition to the S-D logic perspective and its recent emphasis on moving away from the dyad to the business network level.

To further understand the effect of network position on networking capability-access relationships, we interpret the moderation effect tested in Hypothesis H3 through the SNA results using average degree measures. As previously mentioned in section 4.6.5, it is possible to compare two different directed networks using descriptive statistics such as average degree, as recommended by Hansen, Shneiderman and Smith (2011) and Hosseini and Kesler (2013). Average degree denotes the number of edges compared to the number of nodes (Wasserman and Faust, 1994). As shown in Table 5.8, the average degree in the FMCG is 4.906, while in the hospitality business network, the figure is 5. It can be seen that the average degree in the FMCG business network is lower than that in the hospitality business network. In essence, the actors in the FMCG business network have fewer relationships within the same cluster, yet they are more connected with actors in different clusters. On the contrary, the actors in the hospitality business network have more relationships within the same cluster, but are less connected with the actors in different clusters in the network. In essence, the actors in the FMCG business network access more novel ideas and resources than those in the hospitality business network, which contributes to enhanced firm innovativeness (Hosseini and Kesler, 2013; Ichinose *et al.*, 2018; Muller and Peres, 2019). This conclusion is in line with the principles of SWT theory, that non-redundant resources and novel ideas stem from indirect relationships and from outside the ego network (cross-clusters) (Granovetter, 1973; Borgatti and Halgin, 2011). This is an interesting observation from the data analysis, which allows us to conclude that it is not only the number of relationships the actors have that influences the networking capability-access relationships, but it is the origin of these relationships, whether they are from inside or outside the cluster.

These findings are in alignment with the notions of social network theory, social capital theory and the DCV of the firm, in that as network resources are obtainable from the direct interpersonal and inter-organisational relationships within the business network within which an actor is located, the level of an actor`s embeddedness within the overall business network is also important. Based on the social network theory conceptualisation of actors' embeddedness, which takes into account the number of relationships an actor has, and how those relationships are managed through networking capability based upon the DCV of the firm, these findings empirically validate the theoretical assumptions made by Hoang and Antoncic (2003), Zaheer, Gözübüyük and Milanov (2010) and Muller and Peres (2019), by demonstrating that an increase in in-degree centrality would indeed positively moderate the relationship between networking capability and access to resources. In this sense, in the FMCG and hospitality business networks, in-degree centrality increases actors' ability to manage the relationship portfolio in a way that enhances their access to resources obtained from those they are associated with. To the best of our knowledge, this moderating effect of in-degree centrality has not been previously tested, and therefore this finding is one of the unique contributions of this research. The following section discusses the relationship between closeness centrality, networking capability and access to resources.

6.3.2 Hypothesis 4 – Closeness centrality moderates the relationship between networking capability and access

Hypothesis 4 tested the moderating effect of closeness centrality on the relationship between networking capability and access to resources. The argument made in Chapter 3 (Theoretical Framework and Research Hypotheses) was that increasing closeness centrality (i.e., actor's proximity to other actors) would increase the strength of the hypothesised effect between networking capability and access to embedded resources in the business network. However, within the SEM analysis, the results in Chapter 5 (Data Analysis and Results) for both business networks (FMCG and hospitality) revealed that there was no significant effect of closeness centrality on the networking capability- access to resources relationship. Therefore, Hypothesis 4 was not supported. It was surprising to obtain this finding from the SEM analysis for the following reasons.

From the social network theory perspective, closeness centrality is believed to be an indicator of the power of reference (Klepac, Kopal and Mri, 2014), and influences the extent and recurrence of resources flow (Soh, 2010; Borgatti and Halgin, 2011). As discussed in the research methodology chapter (Chapter 4), the closeness centrality of an actor captures both the direct and indirect relationships within the business network (Gulati, 1998). Consequently, actors with higher closeness centrality enjoy a greater ability to easily access resources in the business network (Haythornthwaite, 1996; Mani and Luo, 2015; Muller and Peres, 2019). In addition, Mitsuhashi and Min (2016) argue that a more central network position allows actors to efficiently reach others in the business network, which facilitates the formation of new relationships. Since these valuable resources are indispensable for an organisation`s survival and for it to be innovative in a competitive landscape, the DCV of the firm, in combination with social network theory and the RV of competitive advantage (e.g., Dyer and Singh, 1998; Daly, 2010; Mu and Di Benedetto, 2012; Mu, 2014; Perks *et al.*, 2017), suggest that actors should artfully interact with other diverse actors in the network and skilfully manage their relationship portfolio through developing networking capability. The importance of closeness centrality facilitates access to resources and provides actors with robustness, making them indispensable (i.e., they are less vulnerable to being removed from the business network), consequently prompting scholars such as Muller and Peres (2019) to call for further investigation into how it influences innovation performance. Hypothesis 4 was based on these grounds, and upon the foundations of the DCV of the firm, in that competitive advantage is achieved and/or maintained through the process of the creation and acquisition of valuable resources from within the organisation and its external environment (Teece, Pisano and Shuen, 1997; Eisenhardt and Martin, 2000).

Overall, although there is no statistical support through path analysis for Hypothesis 4, Hypothesis 4 is in line with the argument made by Bai, Holmström and Johanson (2016) that it is not the ‘unique’ position that actors occupy in the business network that enhances their performance and access to resources, but rather it is the possession of a ‘unique’ capability, i.e., a networking capability, that allows them to act. Such capability allows actors to build and manage critical interpersonal and inter-organisational relationships within the network. Using this capability, actors can bridge the structural holes and in effect access non-redundant resources and novel ideas. In fact, this finding by itself is further evidence that networking capability is a critical antecedent to the value co-creation process in business networks. It can be seen from the CB-SEM analysis for the FMCG and hospitality business networks that while closeness centrality does not impact the networking capability-access relationships, the actors are still able to access the unique resources and insert them into the value co-creation process in order to produce innovative value propositions, thanks to networking capability. This is evidenced by the fact that the DART model components combined explain 46 percent and 47 per cent of the variance in firm innovativeness in the FMCG and hospitality business networks respectively.

6.4 Reflection

The empirical setting of this study was FMCG and hospitality networks that operate in the MENA region, which contains a mixture of developing and emerging economies. As previously mentioned in section 4.3, actors in such economies endeavour to form interpersonal and inter-organisational relationships with actors in different contexts, such as those in developed countries, in an attempt to (i) access new knowledge, (ii) create social innovations and economic value, and (iii) increase their R&D investment and innovation activities, all of which are essential for leveraging firm innovativeness. In the MENA region context, the study findings suggest that actors in FMCG and hospitality business networks must develop their networking capability to build interpersonal and inter-organisational relationships, consequently crafting their business networks using the digital engagement platforms. Specifically, the findings of this study reveal that networking capability indeed increases actors' ability in these networks to access network resources.

Moreover, the findings indicate that the moderating role of network position due to the possession of networking capability has a positive significant influence on the networking capability-access to resources relationship. The holistic conceptual framework offered by the study takes into account the interconnectedness of multi-stakeholder business networks and the effects of their network position performance. Therefore, using this framework, actors in FMCG and hospitality business networks in the MENA region can (i) identify opportunities in their networks and be more capable of harnessing the diversity of resources that can be accessed through the digital engagement platform, and (ii) rewire their business network by managing their relationship portfolio in a way that allows them to occupy a central position in order to access novel network resources. Access to network resources due to networking capability contributes to the fulfilment of the aim of actors in the MENA region to build such interpersonal and inter-organisational relationships.

These actors would not have achieved this level of access to resources without the adaption and employment of digital engagement platforms. Such platforms ease the search for innovation ideas and new resources in a timely and cost-effective manner. However, mere access to resources by itself will not increase firm innovativeness, as evidenced by this study results. These reveal that access to resources in isolation from the rest of the DART model components has the weakest impact on firm innovativeness, whereas the DART model components combined explained 46 and 47 per cent of the variance in firm innovativeness in the FMCG and hospitality business networks respectively. These findings underscore the extent to which a DART model that is technology-enabled can positively and significantly affect firm innovativeness in FMCG and hospitality business networks in the MENA region. These findings also highlight the critical role played by networking capability as a catalyst for firm innovativeness through a technology-enabled value co-creation process in a multi-stakeholder business network.

However, such open access to network resources and open dialogue facilitated by technology-enabled value co-creation is fraught with risks, such as opportunistic behaviour and unethical exploitation of resources. In fact, in the developing and emerging economy context, scholars such as Kafouros and Forsans (2012), Adomako, Amankwah-Amoah and Danso (2019) and De Silva *et al.* (2020) argue that the actors are characterised by weak intellectual property protection, corruption and a lack of formal institutions supporting innovation activities. These issues are reflected in the findings of this study, which reveal that transparency among actors has the strongest impact on firm innovativeness, followed by dialogue, as opposed to risk/benefit assessment and access to resources. These findings demonstrate that in the case of the networks studied, the value co-creation process conceptualised by the technology-enabled DART model does indeed address the concerns related to transparency and misappropriation of resources that characterise MENA region actors. Such risks and lack of transparency hinder firm innovativeness and diminish the value of co-creation efforts. The holistic conceptual framework offered by this study allows business networks to overcome the risks associated with the value co-creation process and resource integration and to intervene promptly to address such issues. At the same time, the application of the conceptual framework offered by the study allows the business networks to identify slack resources embedded in their networks, which would be beneficial for NPD and NSD.

6.5 Summary

This chapter has discussed and explained in detail the empirical findings of the SEM and SNA presented in Chapter 5 (Data Analysis and Results). The research hypotheses pertaining to the direct effect of networking capability on the DART model (Hypotheses 1a-d) and those to the impact of the DART model on firm innovativeness (Hypotheses 2a-d) are all accepted. The research findings have demonstrated that in the FMCG and hospitality networks, the networking capability has the strongest impact on access to network resources, compared to the other DART model components. Similarly, the research findings indicate that transparency among actors has the strongest impact on firm innovativeness, as opposed to dialogue, access to resources and risk/benefit assessment. On the other hand, in terms of the moderating role of network position on the networking capability-access to resources relationship, in-degree centrality (Hypothesis 3) was found to have a positive significant influence. However, this moderating effect was not found when closeness centrality was treated as a moderator (Hypothesis 4).

The research questions posed in the introductory chapter (Chapter 1) have been answered primarily through SEM analysis; besides extracting the network position constructs to be treated as moderators in the hypothesised model, SNA complemented the SEM findings with more insights. This combination of SEM with SNA has provided a unique perspective of how the network structure can impact the value co-creation process in terms of facilitating access to embedded resources in the business network, and enabling actors to connect with others. This combination has also allowed for broader conclusions to be drawn about networking capability and its impact on the value co-creation process. In addition, it also indicates areas that require further investigation to fully understand the role that network position plays within the value co-creation process in a business network.

The following chapter is the conclusion, which concludes the research by emphasising its outcomes and discussing how these have answered the research questions and achieved the research aims. The chapter also highlights the theoretical and practical contributions of the research, discussing its limitations and suggesting recommendations for future studies.

Chapter 7. Conclusion

This research has attempted to investigate the technology-enabled value co-creation process in a business network setting. In doing so, it has made several contributions to both the development of the marketing literature, especially to the value co-creation strand, and to the expansion of the S-D logic perspective. It has also contributed to the richness of the field of research into business networks. The previous chapter (i.e., Chapter 6: Discussion) presented in detail a discussion of the research findings from the FMCG and hospitality business networks, and how these contribute to the current literature on networking capability, value co-creation and business networks.

This final chapter summarises the contributions of the research and discusses its limitations and future directions for investigation. The chapter begins by presenting an overview of the research aim, objectives, and motivations for conducting it, followed by discussion of the study contributions. It proceeds by indicating the limitations of the research, together with recommendations for future study, and ends with concluding remarks that place into context the contributions of the research within the wider S-D logic perspective theoretical discourse.

7.1 Overview of the research aims, objectives and motivations

In the last decade, developments in digital technologies have made individuals and organisations (both are referred to as actors) more connected than ever. These developments have unleashed new opportunities for innovation and for the leveraging of the network resources surrounding the actors. In effect, the value co-creation process has been digitally transformed from a linear process between organisations and final customers/clients, to the inclusion of a variety of actors in a more complex system. Breaking out of the dyad in B2C and B2B divides results in a blurred structure of the value co-creation process. As a result, the S-D perspective (Vargo and Lusch, 2004, 2017) advocates the idea that value is co-created by and for all actors in a complex digital value co-creating system, where resources are mobilised and integrated through interactions aimed at mutual benefit. This research asserts that if the value co-creation process is not organised and placed within a clearly defined practical framework, it will be vulnerable to unsuccessful implementation and any value will be volatile and eventually fade away.

As discussed in Chapter 2 (Literature Review), the DCV of the firm refers to organisations' capability to build, integrate and reconfigure their internal and external capabilities and competences in order to cope effectively with the rapid changes in the environment by exploiting the new resources acquired from the actors in the business network (Teece, Pisano and Shuen, 1997; Reypens, Lievens and Blazevic, 2016). This, therefore, provides the actors involved in the value co-creation process with the ability to identify and assess the available resources and capabilities required to enhance the process (Ordanini and Parasuraman, 2011). We have argued that openness to the organisations' external environment will place the actors in unfavourable positions within the business network if they do not have the ability to manage their current and potential relationships under the uncertainty pertaining to ecosystems. Hence, taking the new network-focused view of the S-D logic perspective, the research posits that actors cannot successfully engage in value co-creation until they acquire information about the multiple actors involved in co-creating it, and they are aware of the resources those actors possess. Therefore, use of the DCV of the firm (Teece, Pisano and Shuen, 1997; Teece, 2007) was proposed in combination with the S-D logic perspective to explain how developing a networking capability increases actors' ability to successfully engage in the value co-creation process, and in turn enhance firm innovativeness.

Moreover, social network theory is the study of interactions between various sets of actors within a network, rather than the attributes and characteristics of individual ones (Zaheer, Gözübüyük and Milanov, 2010; Borgatti and Halgin, 2011). Social network theory (Freeman, 1979; Levitt and March, 1988; Wasserman and Faust, 1994) suggests that a central network position reinforces actors' ability to manage their relationships with the others in the business network. In doing so, they gain access to variety of network resources and are exposed to new ideas and knowledge. Furthermore, social network theory posits that higher levels of degree and closeness centrality lead to efficiency in resource dissemination and acquisition. Leveraging the assumptions of social network theory, the research investigated the network position in two business networks, namely FMCG and hospitality. The aim was to improve understanding of how network position influences the networking capability-access relationships, which in turn influence the value co-creation process. A multi-method quantitative research design consisting of SEM and SNA was employed to pursue this aim. The justification for using these theories is as follows.

According to the DCV of the firm, the importance of collaboration between actors in a business network has arisen as a strategic response to the rapid changes in the environment; it aims to create superior competitive advantage through innovation (Teece, 2007; Helfat and Raubitschek, 2018). In light of this, S-D logic favours the holistic view of combining internal and external resources and capabilities in a value co-creation process in order to enhance an organisation`s competitiveness and innovativeness (Taghizadeh *et al.*, 2016). Hence, the use of the DART model as a framework to examine the value co-creation process is relevant for this research.

Social network theory takes into account the web of relationships in business networks in which the actors are embedded (Möller and Halinen, 1999; Borgatti and Foster, 2003). As such, it goes beyond simply being a relational orientation (Daly, 2010), as in the DCV of the firm. Social network theory focuses on the attributes and characteristics of the business network in which the actors are embedded, together with their attributes and characteristics (Wellman, 1988; Borgatti, Brass and Halgin, 2014). Thereby, it provides a holistic view of how the business network structure influences the outcomes of the collaborations among the actors, such as firm performance, innovation and creativity (Borgatti and Foster, 2003; Daly, 2010). Consequently, adopting the views of S-D logic, the DCV of the firm and social network theory allowed this research to fill the research gaps and provide its main contribution, namely the development and empirical testing of a conceptual framework to explain how the various actors in in a multi-stakeholder business network integrate the various operant resources embedded within their network through a technology-enabled value co-creation process, which is necessary to enhance firm innovativeness. Additional contributions include the theoretical, empirical, methodological and practical ones listed in section 7.2.

Building on the above discussions, expansion of the use of the DART model beyond the B2C and B2B dyads was suggested by incorporating networking capability as a critical antecedent of the process in a business network context, and firm innovativeness as a value-based outcome. Therefore, the following objectives were proposed: (i) to examine the impact of networking capability as a catalyst for innovativeness in a technology-enabled value co-creation process, by putting forward networking capability as an antecedent of the technology-enabled value co-creation process; (ii) to examine the extent to which the DART model affects firm innovativeness; and (iii) to investigate and empirically test the possible moderation effect of actors` network position on the networking capability-access to resources relationship.

Overall, the findings of the research challenge the previous assumptions of traditional models of value co-creation, which assume that reciprocity is the key to co-creating value. By integrating diverse theories, namely the S-D logic perspective, the DCV of the firm, and social network theory, the outline of a network-centric view of value co-creation offered by this research proposes an integrated conceptual framework that examines the performance effects of the value co-creation process in digitalised business networks. The conceptual framework proposed by the research is valuable, as it provides a practical approach to the value co-creation process, as well as a theoretical basis for future network-based research on value co-creation and firm innovativeness in digitalised systems.

One of the main motivations for embarking on the research, besides its theoretical, empirical, methodological and practical contributions, was the personal passion of the researcher for the topic. The researcher`s background of working in retail, automobile manufacturing and in the service field, especially in the hospitality industry, inspired the choice of the research topic. Having worked closely with customers in the B2C divide and with suppliers and manufacturers from the B2B divide made the researcher realise the importance of involving various parties in order to introduce more innovative products and services. When pursuing a master's degree in Management with Marketing, it was the first time the researcher was exposed to the value co-creation concept from an academic point of view. It was proposed as an emerging concept in the marketing literature, with a wealth of research gaps, which prompted the focus on *"The role of brand communities in value co-creation behaviour in the B2B context".* The master's thesis was the cornerstone in developing the desire to be part of the scholarly body contributing to knowledge by advancing theories such as the S-D logic perspective and providing practitioners with robust and applicable models, and frameworks that contributed to enhancing performance and profitability. Hence, it was a personal passion to choose to study technology-enabled value co-creation alongside the promising opportunities to provide novel contributions to the growing body of research on value co-creation and the development of the S-D logic perspective. The following section moves the discussion on to the various contributions offered by this study and how it was able to achieve these.

7.2 Research contributions

By testing the ten research hypotheses proposed in Chapter 3 (Theoretical Framework and Research Hypotheses) and supporting the SEM analysis by comparing the SNA results of both the FMCG and hospitality networks, the research findings have helped to answer the overarching research question and its three sub-research questions posed in Chapter 1 (Introduction). The value of this research lies in its notable contributions to the insights of the actors (multiple stakeholders) and their relationships within the value co-creation process in the business network context, as discussed below.

7.2.1 Theoretical contributions

Focusing on the fields of marketing, strategic management, and network-focused research, this research draws together multiple strands of knowledge. In other words, it has the potential to contribute to several streams of research that address similar dimensions and debates on value co-creation, NPD, NSD, innovation performance, tourism management, dynamic capabilities, business networks and ecosystems, as discussed in Chapter 1 (Introduction) and Chapter 2 (Literature Review). Specifically, drawing on the multiple bodies of related literature discussed throughout this research, the generic contributions this research makes to the S-D logic perspective, the DCV of the firm and social network theory provide evidence to support the network conceptualisation (or 'ecosystem', as termed by Vargo and Lusch, (2017)) of the value co-creation process. This research used the S-D logic perspective as a theoretical lens to examine actors' collaborations, interactions and embeddedness, providing a holistic and comprehensive perspective, as well as acknowledging the inter- and multi-level relationships in which the actors are engaging in complex inter-organisational settings (Füller, 2010; Polese, Mele and Gummesson, 2017; Hein *et al.*, 2019). This is an advance over the mainstream orientation, where studies are bound by dyadic B2C and B2B relationships (e.g., Payne, Storbacka and Frow, 2008; Vargo and Lusch, 2008a; Edvardsson, Tronvoll and Gruber, 2011), in order to capture technology-enabled value co-creation.

Most studies consider the outcomes of the relationships and collaborations in a technology-enabled value co-creation process, whereas few look beyond these in order to understand the antecedents (networking capability in this research) together with the outcomes (firm innovativeness) in the business network context (e.g., Mu and Di Benedetto, 2012; Mitrega *et al.*, 2017; Majid *et al.*, 2019; Xu, Yan and Xiong, 2019). Consequently, in fully exploring the dynamic and integrated approach towards the value co-creation process, the novel contributions of this study are first that it offers a holistic conceptual framework to examine the technology-enabled value co-creation process, as conceptualised by the DART model, in a business network context. The research was able to make this contribution through three main steps. The inclusion of networking capability as a critical antecedent and vital component of the value co-creation process was the first step undertaken to expand the DART model to make it a suitable tool to conceptualise the value co-creation process in a business network context. The second step was to test the impact of the DART model on firm innovativeness as a value-based outcome. The final step undertaken was to consider the endogenous nature of network structure and its impact on the value co-creation process. This was achieved by examining the moderation effect of network position on the networking capability-access relationships in section 5.7 using primary data from FMCG and hospitality business networks.

Second, as previous research has tended to favour outcomes and consequences in the value co-creation process (e.g., Mu and Di Benedetto, 2012; Mitrega *et al.*, 2017; Majid *et al.*, 2019; Xu, Yan and Xiong, 2019), this study provides a closer look at one of the antecedents, namely networking capability, that drives and impacts the actors' engagement. The largely unbalanced focus on the outcomes of the relationships and collaborations in a technology-enabled value co-creation process weakens the knowledge of the drivers and factors that influence resource integration and value co-creation among actors, thus diminishing firms' capabilities of devising appropriate marketing or innovative strategies.

As mentioned earlier in Chapter 1 (Introduction), previous research has stressed the significance of investigating the antecedents of the value co-creation process (e.g., Zhang *et al.*, 2015; Murthy *et al.*, 2016), taking into consideration multi-stakeholder relationships and the dynamic nature of business networks. Further, success in coping with the dynamic nature of business networks is largely attributed to the pool of relevant and novel resources that actors can access. This requires them to possess a networking capability, which aids them in navigating existing relationships and exploring potential new ones. Actors who effectively develop and employ a networking capability will efficiently recognise and connect with other actors who have stronger capabilities or valuable resources, which in turn allows them to stay relevant. However, to the best of our knowledge, this is the first study to explore the effects of networking capability on the value co-creation process conceptualised by the DART model, and to empirically explain these effects.

Further, while the results of testing Hypothesis 2a-d are in line with the theoretical emphasis made by previous studies (e.g., Amara and Landry, 2005; Nieto and Santamaría, 2007; Vega-Jurado *et al.*, 2008; Ozdemir *et al.*, 2020), we contribute to the literature and to the debate on the access-innovation relationship by empirically validating them. Although the assumption that higher accessibility to various resources results in enhancement of innovativeness and of innovation performance as a whole, to the best of our knowledge the impact of the DART model components as 'constructs' on the outcome(s) of the value co-creation process (in this case, firm innovativeness) has rarely been empirically studied. The few exceptions identified have attempted to develop and validate a scale for the DART model, as discussed in the literature review chapter (Chapter 2). This thesis, therefore, extends the existing knowledge on value co-creation and provides fresh insights into the emerging S-D logic perspective. This was possible by (i) providing a theory-based explanation and empirical evidence for how networking capability can be a catalyst for innovativeness through a technology-enabled value co-creation process in a multi-stakeholder business network; and (ii) making an in-depth investigation of the factors influencing the value co-creation process in a multi-stakeholder business network. This was coupled with a detailed analysis of the unique influence of networking capability on each component of the DART model (findings of Hypotheses 1a-d), and how each of these components impacts firm innovativeness.

Finally, although individual actors occupy different positions embedded in the business network, little attention has been paid to the essential role of their embeddedness. Specifically, diverse strands of network-focused research acknowledge the role of actors' embeddedness in impacting resource integration and accessing resources (e.g., Gilsing *et al.*, 2008; Hsueh, Lin and Li, 2010; Arranz, Arroyabe and Fernandez, 2020). However, to date, little has been done to examine this phenomenon through the theoretical lens of S-D logic.

This research recognises the lack of attention paid by scholars to the impact of network structure on resource integration and access to network resources. Examples of some of the few related studies in the specific area of networking capability and value co-creation are those of Swaminathan and Moorman (2009), Jaakkola and Hakanen (2013), Perks *et al.* (2017) and McGrath, Medlin and O'Toole (2019). One of the unique contributions of this research is that it enriches and complements the theoretical perspective of the S-D logic perspective by drawing upon social network theory in the interpretation of the CB-SEM results through its theoretical lens, and empirically through SNA. Consequently, this research emphasises the importance of the endogenous role of network structure in resource integration when examining the value co-creation process in the network and has empirically tested this argument. This was achieved through addressing the need for a greater understanding of how network position can impact the value co-creation process, by examining the moderation effect that network position has, specifically in-degree (Hypothesis 3) and closeness centrality (Hypothesis 4), on the relationship between networking capability and actors` ability to access embedded resources in the business network.

By doing so, we contribute to the literature and to the debate on the need for improved understanding of the access to network resources required for (i) the value co-creation process; and (ii) enhancing innovativeness and firm performance based on network structure, as discussed by scholars such as Siltaloppi and Vargo (2017), Ng and Vargo (2018), Salleh *et al.* (2018), Muller and Peres (2019) and Arranz, Arroyabe and Fernandez (2020). By highlighting the critical roles played by these factors which revolve around the value co-creation process, it is suggested that future developments of the S-D logic perspective should take into account: (i) the capabilities actors are required to possess in order to engage in the value co-creation process; (ii) how the network structure in general, and the network position in particular, impact both actors' networking capability and the value co-creation process; and (iii) the impact these factors may have on value-based outcomes, such as firm innovativeness.

7.2.2 Methodological and empirical contributions

Although a few studies have examined the network structure constructs using statistical techniques such as multiple regression and SEM, they did not go beyond using those network structure constructs (e.g., centrality measures) in the model, to performing SNA. SNA provides more clarity for the SEM results and enhances understanding of different aspects of the business network that are not possible to derive from SEM (e.g., the small-world index and clustering coefficient). This study introduced a novel research method for value co-creation studies by combining SEM and SNA beyond the mere use of SNA to generate constructs to be examined through SEM, to extending the analysis by using network measures and interpreting SEM results through the lens of SNA. We argued in Chapter 1 (Introduction) that the lens of social network theory, and the interpretation of the results of CB-SEM from an SNA perspective beyond the mere extraction of centrality measures treated as constructs in the structural model, would facilitate a deeper comprehension of the influence of network structure on the actors in general, and the value co-creation process in particular. This provides the S-D logic perspective and the social network theory in the value co-creation context with clearer conceptual reasoning concerning the value co-creation process enabled by digital technologies in a business network setting. The thesis, therefore, has been able to achieve this objective through the in-depth quantitative analysis of primary datasets from the FMCG and hospitality business networks, which has led to empirical, contextual and methodological contributions besides the theoretical ones.

With regard to the social network theory application in value co-creation studies, this research has attempted to advance understanding of the role of network position in the value co-creation process. In the general areas of network-focused and value co-creation research, a plethora of scholars have written conceptual articles and conducted qualitative research with propositions concerning frameworks of the value co-creation process and the importance of broadening the perspective of value co-creation, and have called for investigations into the antecedents and external factors (e.g., network structure) of the process. This study has provided empirical evidence and through SEM and SNA further supports such articles. Its findings, specifically the theoretical framework proposed to expand the use of the DART model to suit the business network context, strengthen the growing body of literature on value co-creation and further develops the S-D logic perspective. Moreover, the research lays the foundations for future work, which will further contribute to the S-D logic perspective, the IS literature and social capital theory, as described in detail in section 7.4.

7.2.3 Managerial implications

The knowledge and empirical findings obtained in this research will allow organisations to devise appropriate strategies to gauge the full potential of the actors in the business network together with their resources, thus strengthening firm innovativeness and competences in a competitive environment. The proposed theoretical framework of this research will help managers to understand how their business network as a whole may influence their innovativeness, providing them with more clarity on what capabilities they need to successfully engage in the value co-creation process, as well as ensuring that the digital engagement platform they use is employing the DART model to encourage the value co-creation process. In due course, managers will increasingly recognise that engagement in the value co-creation process using digital platforms will unlock new valuable and novel resources, which will ultimately increase firm innovativeness and performance. In effect, managers will be able to create superior value propositions tailored to their customers and/or clients' needs and wants in the target market. Moreover, they will be able to proactively identify technological developments in the market through their business network actors, and integrate these in their value propositions, consequently boosting firm performance. Therefore, in order to achieve the desired outcomes of technology-enabled value co-creation, practitioners need to be aware of the necessity to develop networking capability to manage the relationship portfolio amongst multiple actors, resulting in a successful value co-creation process and enhancement of innovativeness.

Further, the findings of this research highlight the importance for managers to recognise the critical role of their organisation`s network position, and the necessity to understand the importance of weak ties in accessing novel ideas and grasping innovation opportunities. Therefore, based on the study findings, we recommend that organisations and digital engagement platform developers consider the DART model component when developing and designing a digital engagement platform aimed at value co-creation. The platform should allow actors to find others they are not directly linked with; have features that enable interactive communications; facilitate risk/benefit assessment; and ensure transparency among the actors.

Managers should see through the business network and take into consideration how the digital engagement platforms may affect the whole context in which they operate, and how such platforms will rewire the business network. Therefore, we also recommend that the design of the digital engagement platform should facilitate the generation of network maps (graphs), in a way that allows the actors to see their location in the business network, and act upon that location according to the study findings to harness the full potential of the network. Valuable resources, innovation opportunities, and competitive advantage through innovativeness may fade away or become costly to secure if an organisation occupies a peripheral position in the business network. Therefore, through networking capability and evaluation of the value co-creation process using the DART model components, managers should be able to take strategic decisions on what resources to integrate, and with whom they form interpersonal and inter-organisational relationships. All these decisions should have an impact on the organisation`s relationship portfolio, network position, access to the embedded resources required for the value co-creation process, and thereby build long-term firm innovativeness.

7.3 Limitations

Alongside the theoretical, empirical, methodological and practical contributions that this research offers, we acknowledge the existence of several limitations.

First, our findings are based on data from business networks that operate in two sectors within the MENA region: FMCG and hospitality. We recommend that future research should test the model with other sectors such as IT and electronics, whose business networks might be faced with fiercer competition, and are characterised by more complexity. Testing the model across different industries will further strengthen the ability to generalise the results of this research.

Second, since this research is network-based, the unit of analysis was the actor (organisation), with a representative of each of these, i.e., the CMO or someone in an equivalent position, as the unit of observation (see section 4.6.3). In effect, the final customers' and/or client's perspective of the value co-creation process was established through the organisations, which was inevitable for two reasons:

i. The research design included SNA to generate the network position constructs to be examined through SEM. Since the constructs of our theoretical framework are at the firm-level, the SNA unit of analysis should match the unit of analysis for the theoretical framework constructs in order to be able to test for moderation. Therefore, customers' and/or client's perspectives on the value co-creation process in this study were excluded.

ii. The nature of the digital engagement platforms employed by the two business networks. Final customers and/or clients do not have direct access to the central digital engagement platform; instead, their participation in the value co-creation process occurs in sub-platforms, such as social media and other interactive platforms developed and governed by the B2C actors in the business network.

Third, the design of digital engagement platforms employed by the FMCG and hospitality business networks were studied in the thesis. These seem to be designed in a way that facilitates hierarchical, rather than flatter/more linear, communication. In turn, this might affect the strength of the impact of networking capability on dialogue (see section 6.1.1). This limitation will be discussed in the following section (Recommendations for future research).

Fourth, the design of this research is limited in the scope of the identified research gaps and is reflected in the constructs included within the theoretical framework. Therefore, we note that there are four limitations to the research design.

i. In alignment with the literature on firm innovativeness, this research employed the control variable function as one of the solutions used in current research to address and control for any anticipated endogeneity bias. In particular, we controlled for firm size, firm age, and industry type (see sections 4.7.1.1 and 4.10.5). Although previous studies have acknowledged other control variables that might affect firm innovativeness, such as firm capital; the actors' financial resources (e.g., Tellis, Prabhu and Chandy, 2009; Hsieh and Hsieh, 2015; Rodrigo-Alarcón *et al.*, 2017), R&D intensity (e.g., Boso *et al.*, 2013; Demirkan, 2018; Jiao, Baird and Harrison, 2020), collaboration frequency (e.g., Katila and Ahuja, 2002) and market structure (e.g., Rogers, 2004), we only included firm size, firm age and industry type as control variables in the theoretical model for several reasons. First, Rogers (2004) argues that although the literature suggests sets of control variables, it is difficult to control for certain variables such as market structure in empirical analysis. Second, not all organisations publish their R&D expenditure or make it available to the public. Third, we could find no information regarding the financial resources of all the participants through governmental and official websites in the MENA region, such as the Jordanian companies control department (CCD). However, this limitation did not affect the robustness of our data analysis. As previously mentioned in section 4.7.1.1., having several controls in the theoretical framework does not necessarily make the data analysis better. That is, the inclusion of control variables should have a theoretical justification and/or empirical support: *"less is more when it comes to statistical control"* (Bernerth *et al.*, 2018, p. 154).

ii. This research used a multi-method approach involving two quantitative methods, SEM and SNA. Although such a quantitative approach confers the research findings with more reliability and validity required for generalisation (Collins and Hussey, 2003), building on Creswell and Clark`s (2007) argument regarding mixed-method approaches, we believed that employing a sequential explanatory approach (a quantitative followed by a qualitative phase) would assist in explaining and refining the interpretation of the quantitative results (Ivankova, Creswell and Stick, 2006), especially with regard to the unsupported hypothesis (the moderating role of closeness centrality). Although we attempted to interpret the unsupported findings of Hypothesis 4 using the lens of social network theory, interviewing the participants may have added more clarity on why having a more central position did not influence their ability to manage their relationship portfolio and strengthen the ability to access network resources.

iii. Considering the specific association between networking capability and access to network resources, we considered network position as a moderator. The SNA revealed that there may also be other factors which moderate this association (e.g., structural holes; see Figure 2.1). Further discussion of these factors is provided in the following section. In addition, other factors unrelated to the network structure not identified in this research may affect the networking capability-access relationship. This suggests the need for further investigation in order to add new insights to the value co-creation process in the business network context.

iv. Considering that the context of the current research is business networks, institutions (i.e., rules, norms, meanings, symbols, practices, and similar aids to collaboration) and institutional arrangements were argued by Vargo, Wieland and Akaka (2015), Vargo and Lusch (2016, 2017), and Ng and Vargo (2018) to play an important role in assisting actors to coordinate service exchange and resource integration between themselves, in that institutions and institutional arrangements may have an influence on the value co-creation process, as discussed in section 6.1.1.

Fifth, in a business network setting, the research questions investigated in this thesis could be extended to cover additional antecedents, such as innovation capability and organisational learning orientation, as well as the consequences, such as sustainable business models and business model innovation, of the value co-creation process aided by digitalised technologies. Sinkula, Baker and Noordewier (1997) define organisational learning orientation as a process through which organisations strive for new approaches to search for, create and utilise knowledge by developing a set of organisational values. Further, these questions can be extended to add another dimension to the proposed theoretical model of the technology-enabled value co-creation process in business networks, by also incorporating the mediating role of IT integration between networking capability and the DART model. IT integration is defined as *"the ability of a firm to integrate data, communication technologies, and transaction and collaboration applications with its inter-organisational portfolio"* (Rai and Tang, 2010, p. 521). However, the research questions are partially limited by the context of the research and its objectives, as mentioned in point 4. These constructs, and how they can extend the current research, are discussed in section 7.4.

Finally, in addition to the theoretical and empirical limitations, and limited access to some data, time constraints were another limitation of the research. As mentioned in point 4b above, a qualitative phase seems to be a logical step to pursue after the quantitative multi-method approach. In taking this approach, Ivankova, Creswell and Stick (2006) proposed the use of case studies and thematic analysis within each case study and across cases. However, given the time constraints and lack of funding granted to the researcher to pursue this doctoral degree, it was not possible to adopt such an approach at this stage. We provide a discussion of how this research could be conducted using sequential explanatory design and what problems future research might encounter in the following section.

Whilst this study suffers from the limitations discussed above, they do not detract from the novel contribution and broader application of the research to the wider value co-creation literature in particular, and more broadly to the marketing and strategic management fields.

7.4 Recommendations for future research

There are several possibilities for further research resulting from this study, which could solve some of the limitations described, apply the proposed theoretical framework of value co-creation to different industries to increase the generalisability of the findings, and investigate the influence of network position through the lens of social network theory and social capital theory.

By excluding the moderating role of network position and only focusing on the direct effect within the theoretical framework, future research could redesign the constructs for them to be appropriate for micro-level units of analysis in order to include the final customers and/or clients. Since these are part of the business network, including them could reveal more insights into their perspective of the value co-creation process. Such a model would provide answers to how the value co-creation process in a business network context can enhance the experience of value co-creation from customer`s and/or clients` points of view in a digitalised world.

As noted in section 7.3, the theoretical framework did not include additional antecedents of the value co-creation process, such as innovation capability (Zhang *et al.*, 2015) or other value-based outcomes such as sustainable business models (Reypens, Lievens and Blazevic, 2016). Furthermore, we argue that organisational learning orientation (Liu, Luo and Shi, 2002; Mavondo, Chimhanzi and Stewart, 2005) constitutes a critical antecedent for the value co-creation process. Sinkula, Baker and Noordewier (1997) argue that due to organisational learning orientation, organisations develop a set of values with the aim of exploring and exploiting knowledge from their ecosystem. These values include openness to the external environment, active interactions with the various stakeholders, the willingness to share and integrate resources, and commitment to learning (Day, 1992; Liu, Luo and Shi, 2002). Similarly, the competitive advantage theory (Hunt and Morgan, 1995) acknowledges organisational learning as a critical source of new knowledge, which in turn leads to enhancement of the organisational outcomes, and more competitive advantage within markets characterised by fierce competition. The discussion of organisational learning orientation is in line with the foundations of the S-D logic perspective, in that the various actors should interact, collaborate, share and integrate resources with the aim of mutual value co-creation. It would be a promising area of research for future studies to investigate the extent to which some aspects of organisational behaviour such as organisational learning orientation can impact the value co-creation process.

Future research could also investigate the roles of institutions and institutional arrangements in the value co-creation process. Vargo and Lusch (2016, 2017) and Ng and Vargo (2018) acknowledge that although institutions and institutional arrangements have been well investigated and are prevalent in other streams of research such as in economics and organisational studies, they are underexplored in the marketing literature. The investigation of institutions and institutional arrangements will further advance the S-D logic perspective and contribute to the marketing literature by clarifying how institutions and institutional arrangements impact the resource integration and structure of business networks.

Another important line of future research would be the mediating role of IT integration. As discussed throughout this research, organisations are tending to increasingly adopt digital technologies in developing their value propositions. Nowadays, they endeavour to leverage network resources and build the ability to manage the relationship portfolio (i.e., networking capability) to access network resources. The adoption of digital engagement platforms and the orientation towards connectivity require the actors to develop a level of IT integration capabilities (Rai and Tang, 2010). Hence, future research could answer the question:

To what extent does IT integration capability mediate the relationships between networking capability and actors' ability to access network resources?

Answering this question could result in a number of contributions to the IS literature, DCV of the firm, and the S-D logic through broadening the perspective of the necessary capabilities actors should have to enhance their performance.

We acknowledged at several points in the thesis that the SNA aimed to enrich the hypothesis testing in three distinct ways. First, by extracting the centrality measures, namely in-degree and closeness centrality, to be treated as moderating constructs in the theoretical framework. Second, by interpreting the results of the moderation effects testing so as to provide more insight and to improve understanding of how actors' network position influences the relationship between networking capability and access. Third, by mapping and comparing the FMCG and hospitality business networks against each other. The network maps provided the research with the ability to make a visual and statistical analysis of the network structure and to make such a comparison. However, SNA revealed that there are other network structure parameters that could influence the networking capability-access to resources relationship in particular, and the value co-creation process in general. The fact that the empirical setting of this research consisted of unweighted networks (no weights were given to the ties, as this was not the focus of this research) limited our ability to test other parameters such as eigenvector centrality (i.e., the measure of the influence an actor has in the business network) (Wasserman and Faust, 1994; Newman, 2003) and structural holes (Burt, 1992). Future research could further examine how the number of structural holes and the strategies undertaken by actors to bridge these might affect the value co-creation process.

In addition, eigenvector centrality provides an indication about an actor`s prominence (Bonacich, 2007), since high eigenvector centrality levels indicate that the actor is connected to several others, who in turn are also connected to many other actors (Bonacich, 2007; Piazza *et al.*, 2019). In essence, a prominent network position provides actors with several advantages, such as the ability to reach a large number of diverse resources, reduce the costs associated with searching for new ideas and innovation opportunities, and enhance their relational capabilities, consequently refining their ability to manage their relationship portfolio (Ahuja, 2000a; Mazzola, Bruccoleri and Perrone, 2016; Piazza *et al.*, 2019). Therefore, future research could investigate how the prominence of the network position influences the value co-creation process, and consequently firm performance.

As previously mentioned, the findings of this research are in line with social capital theory (Coleman, 1988; Nahapiet and Ghoshal, 1998) in asserting the importance of interpersonal relationships in accessing to resources, and influencing the extent to which resource sharing and deployment occur in the business network. There is a clear crossover between social capital theory and the S-D logic perspective, and between the social capital theory and the structural holes theory (Borgatti and Halgin, 2011), as all advocate the importance of being part of a network, and how actors could improve their outcomes by interacting with and integrating resources with the network actors. Since social capital theory concerns the ego network (Borgatti and Halgin, 2011), future research could investigate the value co-creation process through the lens of social capital theory to refine the understanding of how interpersonal relationships in particular impact the process.

Future research could also go further by undertaking a mixed-method sequential explanatory design (QUANT→ QUAL, to explain interpretations), combining the strengths of different methods and mitigating their weakness, thus allowing for more robust analysis (Ivankova, Creswell and Stick, 2006; Creswell and Clark, 2007). Ivankova, Creswell and Stick (2006) acknowledge that the findings of quantitative methods provide a general understanding of the research problem. In effect, depending on one method is usually insufficient for developing a deeper understanding of the issue under investigation by exploring the participants` views in more depth. Therefore, complementing the quantitative method used in this research with a qualitative phase would help refine the quantitative results in a way that would provide further explanation of and elaboration on the research findings.

Contrary to the assertion of the DCV of the firm and the research on networking capability (e.g., Kohtamäki *et al.*, 2013; Kohtamäki and Rajala, 2016; Mostafa, 2016) which claims that increased networking capability is associated with an increase in communications among the actors, the findings from this research show that the influence of networking capability on dialogue, as one of the DART model components, is not very substantial. We argued in sections 6.1.1 and 7.3 that might be due to the hierarchical communication that takes place as a result of the digital engagement platforms design. Future research could investigate how the networking capability-dialogue relationship takes place in digital engagement platforms designed to facilitate linear, rather than hierarchical, communication.

Finally, our literature review revealed that the majority of the research on value co-creation praises the advantages and benefits of the process, overlooking some of its drawbacks. To the best of our knowledge, to date (as of March 2021) there have only been a few authors, such as Gebauer, Füller and Pezzei (2013), Chowdhury, Gruber and Zolkiewski (2016) and Tóth *et al.* (2018), who have touched upon the negative 'dark' side of value co-creation. However, this research posits that the use of the DART model allows the actors to mitigate some of the issues associated with inter-organisational relationships and that it might have an impact on the value co-creation process. These issues include, but are not limited to, opportunistic behaviour (e.g., appropriation of knowledge), conflicts of interest, the challenges of the shared decision-making processes, role conflicts and ambiguity, dysfunctional conflict, patents and copyright issues, implementation challenges and power plays (Gulati, 1998; Madhok and Tallman, 1998; Hennart, Roehl and Zietlow, 1999; Anand and Khanna, 2000; Wathne and Heide, 2000; Walter, Auer and Ritter, 2006; Gebauer, Füller and Pezzei, 2013; Chowdhury, Gruber and Zolkiewski, 2016; Mitrega *et al.*, 2017; Tóth *et al.*, 2018). Investigating the negative side of value co-creation will provide scholars and practitioners with more clarity of how actors can govern their relationships in order to cope with ambiguity in business relationships and contingencies in the business network.

7.5 Concluding remarks

The concept of value co-creation has significantly evolved since its inception in 2004, today reaching the status of a business network-centric phenomenon. However, these developments have remained confined to theories and concepts, without the provision of a practical framework to consolidate them and make them viable for further theory development and practice. Although the recent emphasis of the S-D logic perspective that value co-creation occurs in a complex multi-stakeholder system, the literature has up to now overlooked the notions of dynamic capabilities and network structure that have an influence on the value co-creation process. Previous studies have acknowledged that the notion of the value co-creation process has three dimensions: value, actors and digital engagement platforms. However, this study has highlighted that there are other endogenous factors such as networking capability and network position, that work together to influence the technology-enabled value co-creation process and its performance effects.

The contributions of this thesis are more relevant now for scholars and practitioners in the current COVID-19 crisis, who have underlined the influence of COVID-19 in accelerating the need for virtual connectivity/collaboration across all sectors (Baig *et al.*, 2020; Nielsen, 2020; Shankar, 2020; Ting *et al.*, 2020). Scholars must account for the role networking capability plays in the technology-enabled value co-creation process. Therefore, the growing importance of business networks makes it urgent to develop a deeper appreciation of networking capability and its critical role in value co-creation.

It is hoped that this research will provoke discussion at three levels. First, more empirical work is needed and more methodological approaches such as multi- and mixed methods should be employed to investigate the value co-creation process from a business network perspective to avoid reaching an impasse in the S-D logic perspective development. Second, the S-D logic perspective should be anchored more on the foundations of social network theory. Although S-D logic has recently broadened its perspective to encompass business networks and has called for further investigation into the factors that influence the value co-creation process, this research has found that network structure is the missing link to providing a more complete theoretical model of value co-creation. Finally, further advancements in the S-D logic perspective will require acknowledgement of the negative sides of co-creation, and what mechanisms and procedures should be put in place to govern its negative effects.

Whilst this research has raised more research questions and noted a number of limitations, the novel contributions provided by it to some extent go to refining the greater understanding of the performance effects of technology-enabled value co-creation in a business network context, together with the network structure effects on the process.

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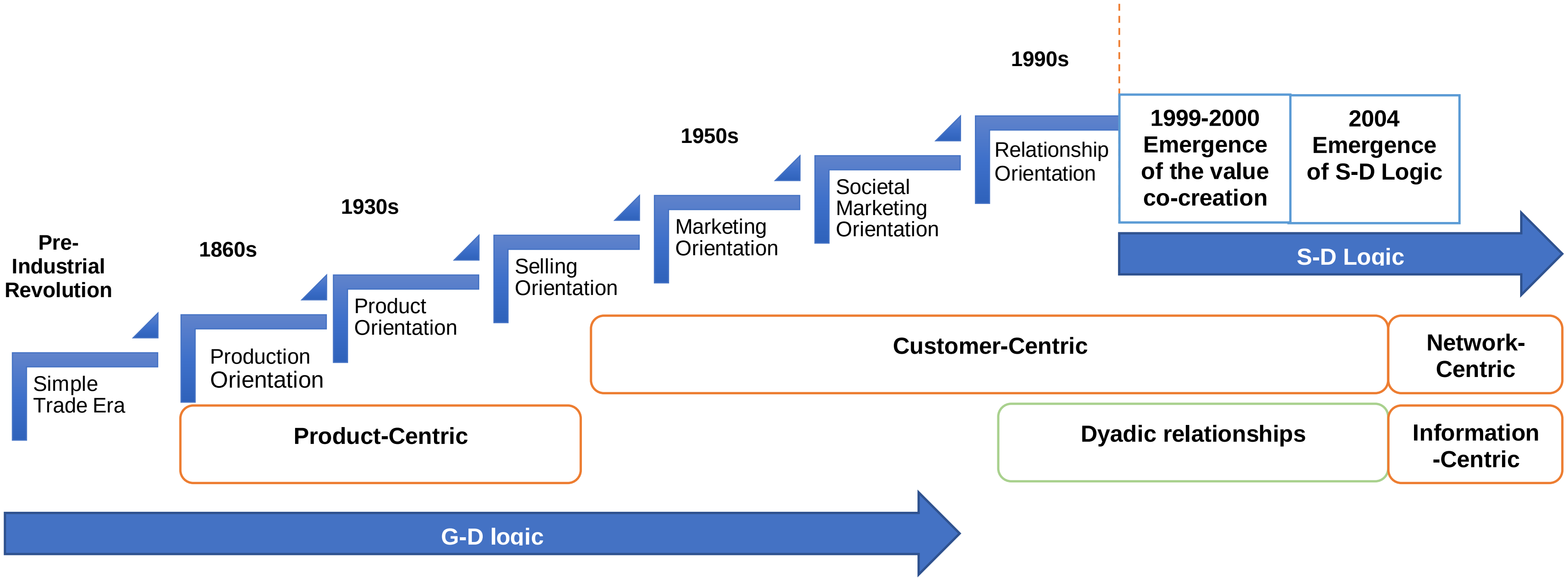
Appendices

Appendix 1: Timeline of the emergence of the value co-creation concept.



Source: Own elaboration.

Appendix 2: Conceptualisation of value co-creation.

Primarily from a Firm Perspective				
Author(s)	**Conceptualisation**	**Conceptual Domain**	**Discipline**	**Perspective**
Normann and Ramírez (1994)	Actors come together to coproduce value	Coproduction: *delivering value to the customer*	Strategic management	Successful companies do not just add value, they reinvent it
Gummesson (1996)	Coproduction is the process of involving customers in joint production and thus joint value creation [with the firm]	Coproduction: *joint value creation through dyadic interaction*	Nordic School	Customer inputs into firm processes, aligning them as temporary members of the firm
Wikström (1996)	When the customer is conceived as a coproducer, the interaction between the parties should generate more value than a traditional transaction process	Coproduction: *creating value with the customer*	Industrial markets, management and learning	The consumer is positioned as a resource in the company's value-creating (profit generating) systems
Wikström (1996b)	Companies design a system of activities within which customers can create their own value, thus the company complements the knowledge and resources already possessed by its customers	Value creation: *[Firm activities] with the aim of developing an interactive way of working... thus making it easier for consumers to achieve more value*	Strategic management	In consumer markets the interaction has to be programmed and is thus generally rather static due to the large number involved
Ramírez (1999)	Coproduction is a framework for understanding value-creation processes that exist within interactions between producers and consumers	Coproduction: *joint value creation through dyadic interaction*	Strategic management	Value coproduced by two or more actors, with and for each other, with and yet for other actors
Prahalad and Ramaswamy (2000)	Co-create personalized experiences with customers—customers want to shape these experiences themselves, both individually or with experts or other customers	Value co-creation	Strategy	Value co-created through experience with others outside the service provider dyad—other customers, other experts

Table continues

Appendix 2 (Continued)	Primarily from a Firm Perspective			
Author(s)	**Conceptualisation**	**Conceptual Domain**	**Discipline**	**Perspective**
Prahalad and Ramaswamy (2003)	There are multiple points of exchange where the consumer and the company can co-create value	Value co-creation	Strategy	Customers search for value beyond the boundaries of the dyad between the firm and the consumer
Prahalad and Ramaswamy (2004)	The co-creation experience—not the offering— becomes the basis of unique value creation	Value co-creation	Strategy	A firm cannot create anything of unique value without the engagement of individuals
Cova and Salle (2008)	Value co-creation process involving actors from both the supply network and the (business) customer network	Value co-creation in networks	Strategy	B2B networks—value comes from supplier networks and customer networks
Grönroos (2008)	Adopting a service logic makes it possible for firms to be involved with their customers' value-generating processes, and the market offering is expanded to including firm-customer interactions	Value co-creation	Nordic School	Customers are always the value creators. The supplier can only be a co-creator of value with its customers
Payne, Storbacka and Frow (2008)	The value co-creation process involves the supplier creating superior value propositions, with customers determining value when a good or service is consumed	Value co-creation	Industrial marketing	Providers offer superior value propositions and customers select from these based on judgments of value
Bolton, in Ostrom *et al.* (2010)	Co-creation (of value) is conceptualized as collaboration in the creation of value through shared inventiveness, design, and other discretionary behaviours	Value co-creation	Service marketing	Customers influence value through collaboration and improving firm offerings
Ng, Maull and Smith (2010)	Value co-creation is ''value-in-use'', that is, jointly co-created between the customer and the firm for benefits . . . customers have abilities to co-create value . . . through customer interactions . . . with resources	Value co-creation	Marketing	Customers influence value through collaboration and improving firm offerings through relationships and/or interactions

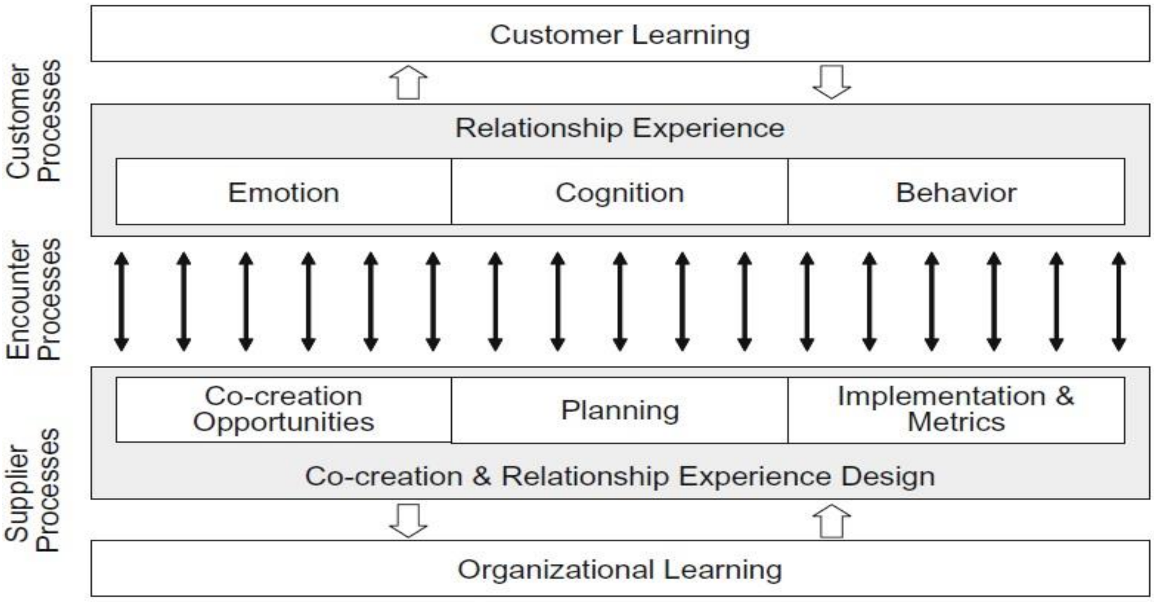
Table continues

Appendix 2 (Continued)		Primarily from a Customer Perspective		
Author(s)	**Conceptualisation**	**Conceptual Domain**	**Discipline**	**Perspective**
Tzokas and Saren (1997)	Value can only be reached by means of blending the activities of two strategically positioned yet highly dependent systems of production and consumption	Customer value creation: *customer activities which give rise to the production and consumption of ‘‘value’’*	Strategic marketing	The activities/mechanisms consumers use in order to reach (project, extract, and consume) value, [the role of marketing is] to identify areas (activities) which can be used as ‘‘relationship platforms’’ between the supplier and the customer
Tzokas and Saren (1999)	Value, for both the firm and the customer, is created in the combined, yet unique, effort of systems of production and consumption working synergistically	Joint value creation: *the customer's value chain is linked to the value chain of the firm*	Relationship marketing	Knowledge produced by means of interaction and dialogue feeds back to the participants, thus giving rise to a new cycle of knowledge creation
Grönroos (2000)	Value for customers is created throughout the relationship with them, partly in interactions between the customer and the supplier or service provider	Customer value creation: *value is created by the customer*	Nordic School Relationship marketing	Value is created by the customer
Vargo and Lusch (2004)	Customers are active participants in relational exchanges and coproduction	Customer coproduction	Service-dominant (S-D) logic	The enterprise can only offer value propositions; the consumer must determine value and participate in creating it through the process of coproduction
Arnould, Price and Avinash (2006)	Consumers deploy their operand resources and use of the firms' operand and operant resources . . . to create value	Co-creation of value	Consumer culture theory (CCT)	Consumers have a stock of their own resources which they deploy to co-create value with firms
Lusch and Vargo (2006b)	The S-D logic notion of value co-creation suggests that there is no value until an offering is used—experience and perception are essential to value determination	Co-creation of value	S-D Logic	Value is only assessed when the value offering is used
Vargo, Lusch and Morgan (2006)	Value is always uniquely and phenomenologically determined by the beneficiary	Co-creation of value	S-D Logic	Customers are the sole arbiters of value (value is determined by the beneficiary)
Table continues				

Appendix 2 (Continued)		Primarily from a Customer Perspective		
Author(s)	**Conceptualisation**	**Conceptual Domain**	**Discipline**	**Perspective**
Lusch, Vargo and O'Brien (2007)	Value can only be determined by the user in the consumption process. Thus, it occurs at the intersection of the offeror, the customer—either in direct interaction or mediated by a good—and other value creation partners	Co-creation of value	Service science	Value is only realized through consumption by customers from their point of view
Vargo, Maglio and Akaka (2008)	Co-creation of value inherently requires participation of more than one service system, and it is through integration and application of resources made available through exchange that value is created	Co-creation of value	Service science	Value is created through resource integration in service systems, networks, and constellations through exchange
Xie, Bagozzi and Troye (2008)	Prosumption is a process rather than a simple act (e.g., the purchase) and consists of an integration of physical activities, mental effort, and sociopsychological experiences	Prosumption	CCT	Resource integration of customer operant resources with firm operand resources
Schau, Muñiz and Arnould (2009)	Consumer collectives are the site of much value creation which emerges through emergent participatory actions of multiple members	Customer value creation *occurs in consumer collectives*	CCT	Value is determined in use and in context and is influenced by social networks and collectives—as consumers construct sense making, prestige and identity
Edvardsson, Tronvoll and Gruber (2011)	Value co-creation is shaped by social forces, is reproduced in social structures, and can be asymmetric for the actors involved	Value co-creation: as a social phenomenon	CCT	Influence of social structures on value co-creation
Heinonen *et al.* (2010)	Firm provides service co-creation of value opportunities; consumers only engage in value creation as part of how consumption activities become a part of their life goals	Customer value creation	Customer-dominant logic	The sites of interest in a customer dominant logic are not exchange and service as such, but how a company's service is and becomes embedded in the customer's contexts, activities, practices, and experiences, and what implications this has for companies.

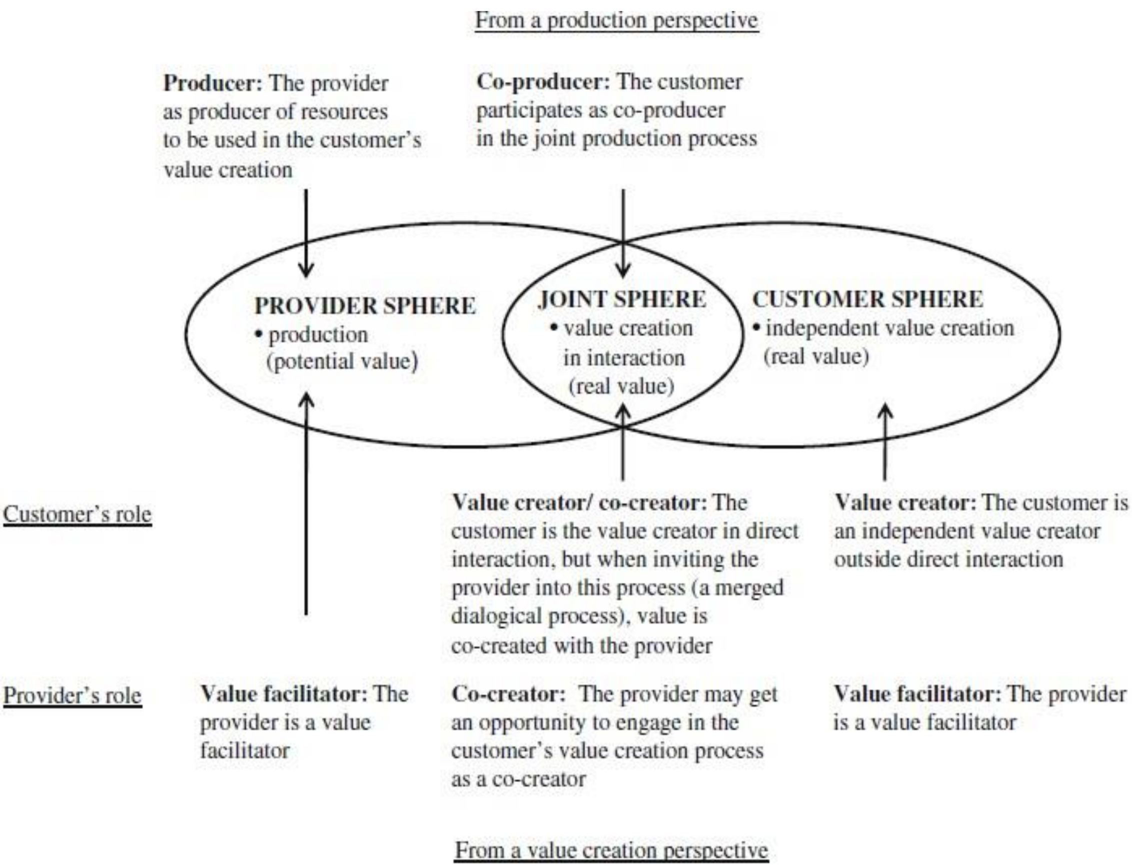
Source: Adopted from McColl-Kennedy *et al.* (2012, pp. 372–374).

Appendix 3: A conceptual framework for value co-creation.



Source: Payne, Storbacka and Frow (2008, p. 86).

Appendix 4: Value creation spheres.



Source: Grönroos and Voima (2013, p. 141).

Appendix 5: Antecedents of value co-creation process in B2B context.

Author (s)	Antecedent(s) of the value co-creation process	Value co-creation process	Value co-creation outcome(s)	Domain	Method
Ngugi, Johnsen and Erdélyi (2010)	**Relational Capabilities** •Human relational capability •Technological relational capability •Management system relational capability •Cultural relational capability	•Resource integration •Process integration •Information sharing	•Cost benefits •Revenue benefits •Gain in new competences •Sharing of risks	Organic food sector	Qualitative •Case studies
Gummesson and Mele (2010)	**•Interaction in a network of parties** -Dialogue -Resource transfer -Learning	•Resource integration: -Complementarity -Redundancy -Mixing (leading to resource matching)	Value co-creation	S-D logic, relationship marketing, many-to-many network approach	Theoretical Discourse
Valjakka *et al.* (2013)	**•Business Model compatibility** **•Perceived value** Value-in-use Value-in-exchange	•Resource integration •Coordination	•Integrated solutions (i.e., product(s) and service(s))	Service networks •Construction •High-tech solutions •Automotive	Qualitative •Case studies
Zhang *et al.* (2015)	**Operant resources /value-focused capabilities:** -Innovation capability -Marketing capability -Networking capability	•Resource integration •Combining capabilities	•Customer value •Brand equity	Variations in firms across manufacturing and service sectors	Quantitative •SEM
Murthy *et al.* (2016)	**•Alliance relationship** **•Strategic intent** **•Service actualization** **•Intrapreneurship** **•Collective capabilities** **Resource management**	Bi-directionality of value co-creation (resource integration)	Relational value spectrum concept (i.e., value outcomes) •Transactional value •Business value •Strategic value	IT services outsourcing	Mixed method •Qualitative (Delphi technique) •Quantitative •(SEM)

Table continues

Appendix 5 (Continued)

Author (s)	Antecedent(s) of the value co-creation process	Value co-creation process	Value co-creation outcome(s)	Domain	Method
Reypens, Lievens and Blazevic (2016)	•Diversity in motives, interests and expectations according to the desired value co-creation outcomes	•Coordination •Consultation •Compromise	•Innovation outcomes: -Developed solutions -Sustainable Business Model •Knowledge outcomes: -Technological -Market -Managerial •Relational outcomes: -Top organisations and experts -Resources	Service (Healthcare)	Qualitative •Grounded Theory
Nardelli and Broumels (2018)	**Relational Capabilities**	Stakeholder co-creation capabilities: •Networking •Competence mapping •Relationship management capabilities	•Competitive advantage •Dynamic capability generation	Services Facility Management Support	Qualitative Longitudinal case study

Source: Own elaboration.

Appendix 6: Definitions related to networking capability.

Term	Definition	Authors
Networking ability	Actors' ability to manage individual relationships and configure network resources in order to improve their network position.	Håkansson and Snehota (1995)
Network competence	The activities undertaken by actors to generate, develop and manage networks in order to benefit from inter-organisational relationships and the business network as a whole.	Gemünden and Ritter (1997)
Relational capacity	Actors' ability to establish and manage relationships with other actors based on their ability to interact with them, and absorb, coordinate and combine resources.	Dyer and Singh (1998)
Network competence	Actors' ability to handle business relationships in their networks.	Ritter, Wilkinson and and Johnston (2002)
Collaborative capability	Actors' ability to build, develop, and manage relationships in the business network.	Blomqvist and Levy (2006)
Network capability	Firm`s ability "*to initiate, maintain, and utilize relationships with various external partners*" (p.546)	Walter, Auer and Ritter (2006)
Relationship capacity	Actors' ability to manage their inter-organisational relationships throughout all stages, i.e. initiating, developing and terminating relationships.	Edvardsson, Holmlund and Strandvik (2008)
Marketing alliance capability	Firms' ability to extract value from inter-organisational relationships over time.	Swaminathan and Moorman (2009)
Network capability	"*the ability to manage and gain benefits from external relationships*" (p.94).	Parida *et al.* (2017)
Network capability	"*the early stage development of the understanding, willingness and ability of the new venture to purposefully engage its business network of relationships to begin to gain access to, and mobilize, resources with other network actors*." (p.128)	O'Toole and McGrath (2018)
Network capability	"*how managers jointly with partners build the capability to access, activate and coshape resources with other firms so as to develop and/or change a network*." (p.214)	McGrath, Medlin and O'Toole (2019)

Appendix 7: Methodological review.

Authors	Domain	Method(s)	Units of Analysis	Data	Data Analysis/ Statistical Model	Findings
			Quantitative			
Ordanini and Parasuraman (2011)	•Service innovation •Service-Dominant Logic (S-D logic)	•Survey •Computer-Aided Telephone Interviewing (CATI)	•Hotel industry •Firm-level (managers)	•Primary data n= 185 •Secondary data	•Three-stage least squares (3SLS)	•COR X INNOR →Volume (NS) •COR→ Volume (NS) •INNOR → Volume (NS) •COR → Radicalness (+) •COR X INNOR → Radicalness (+) •CC→Volume (+) •CC→Radicalness (NS) •BPC→Volume (NS) •BPC→Radicalness (+)
Taghizadeh et al. (2016)	•Service •Innovation strategy	•Survey	•Telecommunication firms •Individual-level: -Managers -Marketing department	•Primary data n= 249	•Partial least squares structural equation modeling (PLS-SEM)	•Dialogue→INNST (+) •Access→INNST (NS) •Risk Assessment →INNST (+) •Transparency→INNST (+)
Donato et al. (2017)	•Value co-creation •Social network analysis	•Survey •Document analysis •Nonparticipant observation technique •Interviews	•Multisector •Firm-level (managers)	•Primary data n= 34 •Secondary data	•Centrality and density metrics (Rating 0-10)→ Average weight	**Mean scores** •Dialogue→6.08 •Access→8.00 •Risk→6.60 •Transparency→6.08 •Engagement Platform→7.46

Table continues

Appendix 7 (Continued)			Quantitative			
Authors	**Domain**	**Method(s)**	**Units of Analysis**	**Data**	**Data Analysis/ Statistical Model**	**Findings**
Xue et al. (2018)	•Industrialized construction technology (ICT) •Collaborative innovation •Social network analysis (SNA)	•Survey	•Industrialized construction manufacturing facilities •Individual level (experienced staff or senior managers)	•Primary data n=185	Combination of: •SNA •Covariance-based structural equation model (CB-SEM)	•NP→TECHINN (+) •RS→TECHINN (+)
			Qualitative			
Jaakkola and Hakanen (2013)	•Service network •Actors/resources/ activities (ARA) model •Value co-creation	•Case study: two case studies •Product based solution •Service based solution •39 in-depth interviews	•Industrial equipment and marketing solution •Network •Individual-level	•Primary data n= 14 firms (nine suppliers, five customers) •Observations (meetings and workshops)	•Narrative description •Cross-case analysis •Triangulation	• Building direct relationships with the network actors is crucial for operant resources integration •The type of integrated resources in business networks is mainly operant resources •In seeking opportunities, actors in the business networks constantly seek to improve their position, which results in conflict and tension among them
Cabiddu, Lui and Piccoli (2013)	•Value co-creation	•Case study •Interviews: -13 semi-structured interviews	•Tourism industry: Hotels Travel agents Car rentals Airlines	•Primary data n=13 •Secondary data: organisational archives	•Cross-case analysis within-case analysis	•IT readiness, synergy and strategic fit of value co-creation objectives among the actors in the business network result in superior performance using digital technologies

Table continues

Appendix 7 (Continued) **Qualitative**

Authors	Domain	Method(s)	Units of Analysis	Data	Data Analysis/ Statistical Model	Findings
Reypens, Lievens and Blazevic (2016)	•Stakeholders' innovation network •Value co-creation	•Grounded theory. Built on a single case study •Interviews: •29 in-depth semi-structured interviews •Prolonged engagement at the research site •	•Healthcare industry (The European Medical Information Framework (EMIF) project)	•Primary data n=29 •Secondary data: project documents	•Systematic procedures (grounded theory guidelines) •Triangulation	•The value outcomes as a result of value co-creation process are relational, knowledge and innovation
Breidbach and Maglio (2016)	•Service system •Value co-creation	•Case study • 37 semi-structured in-depth interviews: -26 face-to-face -11 telephone / video conference	•Consulting firms •Network-level: -Senior managers -Project managers -Employees (consulting firms and customer firms)	•Primary data n=11 firms: -six consulting -five customer firms	•Cross-case analysis (based on a variable-oriented strategy)	•Actors are interdependent and engage in unstructured interactions if the service target is a process. On the other hand, the interactions are structured, and actors are independent if the service target is an output •Face-to-face setting of value co-creation is less affected by resource scarcity than the technology-enabled value co-creation process. •The type of the digital platform used for value co-creation in business networks is driven by the actor who facilitates resource exchange

Table continues

Appendix 7 (Continued)			Qualitative			
Authors	**Domain**	**Method(s)**	**Units of Analysis**	**Data**	**Data Analysis/ Statistical Model**	**Findings**
Nordin et al. (2017)	•Network management •Dynamic capabilities •Networking capability •Collaborations •Value co-creation.	•Longitudinal case study •Interviews: – two in-depth interviews with the chairman of the board (also a founder and former CEO).	•High-tech firms •Start-ups	•Primary data n=N/A •Secondary data: •Collected from the internet, annual reports, etc. •Seven years of case narratives •Individual student case.	•Framework analysis	•Network position consolidation capability consists of two components, namely harvesting and upgrading. –Harvesting →controls information flow and collects information from actors –Upgrading→ the increase in the actors' credibility due to their network position gives the focal (hub) the power to: *Set the terms of cooperation with both new and current actors *Negotiate power *Claim brand visibility •The ability to access information is crucial to reinforce the actors' position
Pagani and Pardo (2017)	•B2B digitalization •Actors/resources/ activities (ARA) model •Business network	•Case study. •Interviews: 18 semi-structures interviews	•Companies belonging to five industries, all in the B2B: •Chemicals and materials •Food and beverage •Healthcare and diagnostics •Automotive •Insurance	•Primary data n=N/A •Secondary data: –Documents provided by each company Used to triangulate ARA model	•Benchmarking analysis using ARA model	•Digital platforms facilitate the coordination and optimisation of current activities in the business networks, which in turn generate new activities and new bonds between the actors

Table continues

Appendix 7 (Continued) **Mixed-Method**

Authors	Domain	Method(s)	Units of Analysis	Data	Data Analysis/ Statistical Model	Findings
Zhang et al. (2018)	•Destination online platforms •Value co-creation •Value-in-experience	•Scenario experiment • Post-experiment survey	•Tourism industry: –Two cities in China as main travel destination •Individual-level (customers)	•30 minutes experiment n= 10 online platforms The experiment group included a total of 523 students allocated in 11 groups in the PC lab •Primary data n=467	Structural equation modeling (SEM)	The mediating effect of destination emotional experience on the relationship between online platform experience and destination engagement intention is positive and significant OPE→DEE (+) DEE→DEI (+)

Note: COR= Customer Orientation; INNOR = Innovation Orientation; CC=Customer Collaboration; BPC=Business Partners Collaboration; INNST=Innovation Strategy; NP=Network Position; TECHINN=Technological Innovation; RS=Relationship Strength; OPE=Online Platform Experience; DEE=Destination Emotional Experience; DEI=Destination Engagement Intention.

Appendix 8: Pilot study participant distribution.

FMCG BN			Hospitality BN		
Company code	**Location**	**n**	**Company code**	**Location**	**n**
C1a	UAE - Dubai	**4**	O1	Jordan - Amman	**13**
C1b	Kuwait - Kuwait	**5**	O2a	Jordan - Amman	**22**
C1c	KSA - Jeddah	**2**	O2b	UAE - Dubai	**18**
C1d	KSA - Riyadh	**1**	O3	Turkey - Antalya	**16**
C1e	Bahrain - Manama	**2**	O4	Turkey - Marmaris	**20**
C2a	UAE - Dubai	**5**	O5	Palestine - Ramallah	**17**
C2b	Kuwait - Kuwait	**6**	O6	UAE - Abu Dhabi	**19**
C2c	KSA - Jeddah	**2**	O7	Cyprus - Nicosia	**18**
C2d	KSA - Riyadh	**1**	O8	Morocco - Casablanca	**16**
C2e	Qatar - Doha	**2**	O9	Jordan - Amman	**12**
C2f	Oman - Muscat	**2**	O10	Turkey - Istanbul	**6**
C2g	Bahrain - Manama	**3**	O11	Morocco - Marrakech	**12**
C3a	UAE - Dubai	**5**	O12	Egypt - Sharm Al Sheikh	**15**
C3b	Kuwait - Kuwait	**6**	O13	Egypt - Cairo	**17**
C4	Kuwait - Kuwait	**15**	O14	Jordan - Amman	**6**
C5a	UAE - Dubai	**3**	O15	Turkey - Marmaris	**6**
C5b	Kuwait - Kuwait	**4**	O16	Egypt - Sharm Al Sheikh	**6**
C5c	KSA - Jeddah	**3**	O17	Egypt - Cairo	**7**
C5d	KSA - Riyadh	**3**	O18	Jordan - Amman	**7**
C6a	UAE - Dubai	**43**	O19	Turkey - Istanbul	**6**
C6b	Kuwait - Kuwait	**57**	O20	Turkey - Istanbul	**1**
C6c	KSA - Jeddah	**5**	O21	Turkey - Istanbul	**1**
C6d	KSA - Riyadh	**6**	O22	Turkey - Istanbul	**1**
C6e	KSA - Dammam	**6**	O23	KSA - Makkah	**8**
C6f	Bahrain - Manama	**17**	O24	KSA - Almandine	**9**
C6g	Iraq - Baghdad	**22**	O25	Jordan - Al Balqa	**5**
C6h	Oman - Muscat	**16**	O26	Jordan - Dead Sea	**6**
C6i	Qatar - Doha	**28**			
C6j	Jordan - Amman	**16**			
Total (n)= 290			**Total (n)= 290**		

Appendix 9: Survey.

Part 1: Cover Letter

Dear Sir/Madam,

You are invited to participate in a study looking at the performance implications of the value co-creation process enabled by a digital technology (i.e., the digital engagement platforms used by business network members for service/product innovation). If you agree to participate in the survey, you will be asked to answer questions regarding the people you regularly interact with in your business network "e.g., Please identify up to 10 people who are important to you in your business network by mentioning their company's name*"*. Please note that these persons should be from outside your company, and each of them should work for a different company.

Your company name, and the company names of the people you mention will not be identified when the information is being transcribed and analysed or in any findings.

All the companies' names will be replaced with alphanumerical codes; for example, person 1 works for company X will be coded as (A1), who may be communicating with person in company Y, company Y will be coded as (A2) …etc. **The research project will not gather personal information**. We are only interested in participants' views and perceptions of organisational processes and structures. Individual responses will be anonymised and pseudonymised (see the example above), so identification of companies and participants (either directly or indirectly) will not be possible. Please note that there are no right or wrong answers.

Completing this survey will take you approximately 10-15 minutes and I hope that you will answer frankly.

Ethical approval was granted by the Kent Business School Ethics committee. Should you need any further information, or request an ethical approval number, please do not hesitate to contact the researcher on the below.

Thank you for your cooperation

Mahmoud Zakarneh

PhD in Marketing candidate - University of Kent
msaz3@kent.ac.uk
mahmoud.zakarneh@hotmail.com
WhatsApp: **************************

Part 2 : Consent

C1. I understand that my responses will be anonymised before analysis.☐

C2. I agree to take part in the above research project.☐

C3. Have you participated in this survey before? Yes ☐ No ☐

Part 3 (Firmographic data and participant`s information)

C4. What is the name of the company you work for?

……………………………………………………………………………

C5. Which location you work in? (country name)

……………………………………………………………………………

Q1.Please choose one of the following regarding your company's core offering:

Products ☐ Services ☐

Q2.How many employees does your company have?

Fewer than 10 employees	☐
10 to 49 employees	☐
50 to 249 employees	☐
250 employees or more	☐

Q3.How long has the company been operating for?

Less than 3 years	☐
3 years or more, but less than 5 years	☐
5 years or more, but less than 7 years	☐
7 years or more, but less than 9 years	☐
9 years or more, but less than 11 years	☐
11 years and more	☐

Q4.In which department do you work?

Production	☐
Research & Development (R&D)	☐
Purchasing	☐
Marketing (including the selling function and client account manager)	☐
Human Resources (HR)	☐
Accounting	☐
Finance	☐
Operations	☐
Quality Assurance	☐
Information Technology (IT)	☐
Logistics	☐
Other (Please specify) ……...	☐

Q5.Which of the following best suits your current job level?

Owner/Executive	☐
Senior management	☐
Middle management	☐
Intermediate	☐
Entry Level	☐
Other	☐
(Please specify) ……...	

Part 4: Business Network

Q6.Please identify up to 10 people (from outside your company) who are important to you in your business network (by mentioning the name of the company they work for). These can be people who provide you with information to do your work, help you think about complex problems posed by your work, or provide developmental advice or personal support helpful in your day-to-day working life. These may or may not be people you communicate with on a regular basis.

Person 1 ……………………………………………………………………

Person 2 ……………………………………………………………………

Person 3 ……………………………………………………………………

Person 4……………………………………………………………………

Person 5 ……………………………………………………………………

Person 6 ……………………………………………………………………

Person 7 ……………………………………………………………………

Person 8 ……………………………………………………………………

Person 9 ……………………………………………………………………

Person 10 ……………………………………………………………………

Q7.Please tick as you find appropriate.

Innovation ties

Statement	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10
Whom are you likely to turn to in order to discuss a new or innovative idea?										
Who is likely to turn to you in order to discuss a new or innovative idea?										

Part 5: Dialogue, Access, Risk/benefit assessment and Transparency (DART)

This part contains variables related to the digital engagement platform you use in your business network.

Q8.Please indicate the extent to which you agree or disagree with the following statements regarding dialogue with your partners by clicking as you find appropriate.

Dialogue

Statement	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
We use diversified communication channels to have dialogue sessions with our partners.					
We conduct dialogue sessions with our partners frequently.					
We involve internal parties during the dialogue sessions with our partners.					
We involve external parties during the dialogue sessions with our partners.					
We recognise our partners' experience regarding our services and/or products.					
We emphasise our employees' efforts to our partners.					

Q9.Please indicate the extent to which you agree or disagree with the following statements regarding access to resources by clicking as you find appropriate.

Access

Statement	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
We offer opportunities to our partners to share in the design process of services and/or products.					
We offer opportunities to our partners to share in the development process of services and/or products.					
We offer opportunities to our partners to share in the price setting process of services and/or products.					
We emphasise more the provision of experiences to our partners than the ownership of services and/or products.					
We provide all the necessary service and/or product-related information to our partners.					

Q10.Please indicate the extent to which you agree or disagree with the following statements regarding risk/benefit assessment by clicking as you find appropriate.

Risk/Benefit assessment

Statement	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
We inform about potential risks of the services and/or products offered to our partners.					
We inform our partners about the limitation of the firm's knowledge and capability.					
We recognise the changing dynamics of our partners' needs.					
We accept our partners' complaints about service and/or product offerings.					
We shoulder all the risk-related responsibilities ourselves.					

Q11.Please indicate the extent to which you agree or disagree with the following statements regarding transparency by clicking as you find appropriate.

Transparency

Statement	**Strongly disagree**	**Somewhat disagree**	**Neither agree nor disagree**	**Somewhat agree**	**Strongly agree**
We clarify service and/or product-related information to our partners.					
We disclose pricing-related information to our partners.					
We get benefit from the information symmetry between our partners and the firm.					
We build trust among partners through transparent information.					
We provide up-to-date information to our partners.					

Part 6: Networking capability and Innovativeness

Q12.Please indicate the extent to which you agree or disagree with the following statements regarding networking capability by clicking as you find appropriate.

Networking capability

Statement	**Strongly disagree**	**Somewhat disagree**	**Neither agree nor disagree**	**Somewhat agree**	**Strongly agree**
We match the use of resources (e.g., personnel, finances) to the business relationship.					
We appoint coordinators who are responsible for the relationships with our partners.					
We have the ability to build good personal relationships with business partners.					
We can put ourselves in our partners' position.					
We know our partners' products/procedures/services.					

Q13.Please indicate the extent to which you agree or disagree with the following statements regarding innovativeness by clicking as you find appropriate.

Innovativeness

Statement	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
We actively introduce improvements and innovations in our business.					
Our business is creative in its methods of operation.					
Our business seeks out new ways to do things.					
Please answer strongly disagree for this statement.					

Part 7: Self-Efficacy

Q14.Please indicate the extent to which you agree or disagree with the following statements regarding self-efficacy by clicking as you find appropriate.

Self-Efficacy

Statement	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I will be able to achieve most of the goals that I have set for myself.					
When facing difficult tasks, I am certain that I will accomplish them.					
In general, I think that I can achieve outcomes that are important to me.					
I believe I can succeed in almost any endeavour I set my mind to.					
I will be able to successfully overcome many challenges.					

Thank you for your participation. We really value your time and input

We would also like to ask you to please share this survey link with the **people you mentioned** in this survey, and not with others. Also, **please do not take part in the survey if you receive it again**.

Your email address (optional) ______ This will only be used to send you a reminder to complete the survey or ask you to remind the people you have nominated to complete it. Your email address will not be stored and will be deleted before the analysis is performed.

Regards
Mahmoud Zakarneh

Survey (Arabic version)

Kent Business School

الجزء :1 مقدمة

عزيزي السيد / السيدة،

أنت مدعو للمشاركة في دراسة تبحث في الآثار المترتبة على الأداء لعملية خلق القيمة المشتركة التي تم تمكينها بواسطة التكنولوجيا الرقمية (أي منصات المشاركة الرقمية التي يستخدمها أعضاء شبكة الأعمال للخدمة / ابتكار المنتج). إذا وافقت على المشاركة في الاستبيان ، فسيُطلب منك الإجابة عن الأسئلة المتعلقة بالأشخاص الذين تتفاعل معهم بانتظام في شبكة عملك "على سبيل المثال ، يرجى تحديد ما يصل إلى 10 أشخاص مهمين بالنسبة لك في شبكة عملك من خلال ذكر اسم شركتهم ". يرجى ملاحظة أن هؤلاء الأشخاص يجب أن يكونوا من خارج شركتك ، ويجب أن يعمل كل منهم في شركة مختلفة.

لن يتم تحديد اسم شركتك وأسماء الشركات للأشخاص الذين تذكرهم عندما يتم نسخ المعلومات وتحليلها أو في أي نتائج.

سيتم استبدال أسماء جميع الشركات برموز أبجدية رقمية ؛ على سبيل المثال ، سيتم ترميز الشخص 1 الذي يعمل في الشركة X على أنه (A1) ، والذي قد يتواصل مع شخص في الشركة Y ، وسيتم ترميز الشركة Y كـ ... (A2) إلخ. لن يقوم مشروع البحث بجمع معلومات شخصية. نحن مهتمون فقط بآراء المشاركين وتصوراتهم للعمليات والهياكل التنظيمية. ستكون الردود الفردية مجهولة المصدر وستكون مستعارة (انظر المثال أعلاه) ، لذلك لن يكون تحديد الشركات والمشاركين (سواء بشكل مباشر أو غير مباشر) ممكنًا. يرجى ملاحظة أنه لا توجد إجابات صحيحة أو خاطئة.

سيستغرق إكمال هذا الاستبيان ما يقرب من 10 إلى 15 دقيقة وآمل أن تجيب بصراحة.

تم منح الموافقة الأخلاقية من قبل لجنة أخلاقيات كلية الأعمال في كينت. إذا كنت بحاجة إلى أي معلومات إضافية ، أو طلب رقم الموافقة الأخلاقية ، فلا تتردد في الاتصال بالباحث أدناه.

شكرا لتعاونكم

محمود زكارنة

مرشح دكتوراه في التسويق - جامعة كنت

msaz3@kent.ac.uk

mahmoud.zakarneh@hotmail.com

واتساب: **********************

الجزء الثاني : الموافقة

م.1 أفهم أن ردودي ستكون مجهولة الهوية قبل التحليل ☐

م.2 أوافق على المشاركة في مشروع البحث أعلاه ☐

م.3 هل شاركت في هذا الاستطلاع من قبل؟ نعم ☐ لا☐

الجزء 3 : بيانات الشركة ومعلومات المشارك

م 4. ما اسم الشركة التي تعمل بها؟

....

م 5. في أي موقع تعمل؟ (اسم الدولة)

....

س 1: الرجاء اختيار أحد الخيارات التالية فيما يتعلق بالعرض الأساسي لشركتك

☐ المنتجات ☐ الخدمات

س 2: كم عدد الموظفين في شركتك؟

- ☐ أقل من 10 موظفين
- ☐ من 10 إلى 49 موظفًا
- ☐ من 50 إلى 249 موظفًا
- ☐ 250 موظف فأكثر

س 3: منذ متى تعمل لدى هذه الشركة؟

- ☐ أقل من 3 سنوات
- ☐ 3 سنوات فأكثر ولكن أقل من 5 سنوات
- ☐ 5 سنوات فأكثر ولكن أقل من 7 سنوات
- ☐ 7 سنوات فأكثر ولكن أقل من 9 سنوات
- ☐ 9 سنوات أو أكثر ولكن أقل من 11 سنة
- ☐ 11 سنة فأكثر

س 4: في أي قسم تعمل؟

- ☐ الإنتاج
- ☐ البحث والتطوير(R & D)
- ☐ الشراء
- ☐ التسويق (بما في ذلك وظيفة البيع ومدير حساب العملاء)
- ☐ الموارد البشرية (HR)
- ☐ المحاسبة
- ☐ التمويل
- ☐ العمليات
- ☐ ضمان الجودة
- ☐ تكنولوجيا المعلومات (IT)
- ☐ الخدمات اللوجستية
- ☐ آخر

(الرجاء التحديد) ....

س 5: أي مما يلي يناسب مستواك الوظيفي الحالي؟

- ☐ مالك / تنفيذي
- ☐ الإدارة العليا
- ☐ الإدارة المركزية
- ☐ الإدارة الوسطى
- ☐ مبتدئ
- ☐ آخر

(الرجاء التحديد) ....

الجزء 4 : شبكة الأعمال

س 6: يرجى تحديد ما يصل إلى 10 أشخاص (من خارج شركتك) مهمين بالنسبة لك في شبكة عملك (من خلال ذكر اسم الشركة التي يعملون بها). يمكن أن يكون هؤلاء أشخاصًا يزودونك بمعلومات للقيام بعملك ، أو يساعدونك في التفكير في المشكلات المعقدة التي يطرحها عملك ، أو يقدمون المشورة التنموية أو الدعم الشخصي المفيد في حياتك العملية اليومية. قد يكون هؤلاء أشخاصًا تتواصل معهم بشكل منتظم وقد لا يكونوا كذلك**.**

الشخص 1..
الشخص 2..
الشخص 3..
الشخص 4..
الشخص 5..
الشخص 6..
الشخص 7..
الشخص 8..
الشخص 9..
الشخص 10..

س 7: يرجى وضع علامة على النحو الذي تجده مناسبًا.

روابط الابتكار

العبارة	**شخص 1**	**شخص 2**	**شخص 3**	**شخص 4**	**شخص 5**	**شخص 6**	**شخص 7**	**شخص 8**	**شخص 9**	**شخص 10**
من الذي من المحتمل أن تلجأ إليه لمناقشة فكرة جديدة أو مبتكرة؟										
من الذي يحتمل أن يلجأ إليك لمناقشة فكرة جديدة أو مبتكرة؟										

الجزء 5 :الحوار والوصول وتقييم المخاطر / الفوائد والشفافية

يحتوي هذا الجزء على متغيرات متعلقة بمنصة المشاركة الرقمية التي تستخدمها في شبكة عملك.

س 8: يُرجى توضيح مدى موافقتك أو عدم موافقتك على العبارات التالية فيما يتعلق (بالحوار) مع شركائك بالنقر حيث ما تراه مناسبًا.

الحوار

العبارة	لا أوافق بشدة	لا أوافق إلى حد ما	لا أوافق ولا أرفض	أوافق إلى حد ما	موافق بشدة
نستخدم قنوات اتصال متنوعة لإجراء جلسات حوار مع شركائنا.					
نجري جلسات حوار مع شركائنا بشكل متكرر.					
نشرك الأطراف الداخلية خلال جلسات الحوار مع شركائنا.					
نقوم بإشراك الأطراف الخارجية خلال جلسات الحوار مع شركائنا.					
نحن ندرك خبرة شركائنا فيما يتعلق بخدماتنا و / أو منتجاتنا.					
نؤكد جهود موظفينا لشركائنا.					

س 9: يرجى الإشارة إلى مدى موافقتك أو عدم موافقتك على العبارات التالية فيما يتعلق (بالوصول إلى الموارد) بالنقر حيث ما تراه مناسبًا.

الوصول إلى الموارد

العبارة	لا أوافق بشدة	لا أوافق إلى حد ما	لا أوافق ولا أرفض	أوافق إلى حد ما	موافق بشدة
نحن نقدم فرصًا لشركائنا للمشاركة في عملية تصميم الخدمات و / أو المنتجات.					
نحن نقدم فرصًا لشركائنا للمشاركة في عملية تطوير الخدمات و / أو المنتجات.					
نحن نقدم فرصًا لشركائنا للمشاركة في عملية تحديد أسعار الخدمات و / أو المنتجات.					
نؤكد على توفير الخبرات لشركائنا أكثر من التركيز على ملكية الخدمات و / أو المنتجات.					
نحن نقدم جميع الخدمات الضرورية و / أو المعلومات المتعلقة بالمنتج لشركائنا.					

س 10: يرجى الإشارة إلى مدى موافقتك أو عدم موافقتك على العبارات التالية فيما يتعلق (بتقييم المخاطر / المنافع) بالنقر حيث ما تراه مناسبًا.

تقييم المخاطر / المنافع

العبارة	لا أوافق بشدة	لا أوافق إلى حد ما	لا أوافق ولا أرفض	أوافق إلى حد ما	موافق بشدة
نقوم بالإبلاغ عن المخاطر المحتملة للخدمات و / أو المنتجات المقدمة لشركائنا.					
نقوم بإبلاغ شركائنا بمحدودية معرفة الشركة وقدرتها.					
نحن ندرك الديناميكيات المتغيرة لاحتياجات شركائنا.					
نقبل شكاوى شركائنا حول الخدمات و / أو عروض المنتجات.					
نحن نتحمل جميع المسؤوليات المتعلقة بالمخاطر بأنفسنا.					

س 11: يرجى الإشارة إلى مدى موافقتك أو عدم موافقتك على العبارات التالية فيما يتعلق (بالشفافية) بالنقر حيث ما تراه مناسبًا.

الشفافية

العبارة	لا أوافق بشدة	لا أوافق إلى حد ما	لا أوافق ولا أرفض	أوافق إلى حد ما	موافق بشدة
نوضح المعلومات المتعلقة بالخدمة و / أو المنتج لشركائنا.					
نكشف المعلومات المتعلقة بالتسعير لشركائنا.					
نستفيد من تناسق المعلومات بين شركائنا والشركة.					
نبني الثقة بين الشركاء من خلال المعلومات الشفافة.					
نحن نقدم معلومات محدثة لشركائنا.					

<u>الجزء 6 : القدرة على التواصل والابتكار</u>

س 12: يرجى الإشارة إلى مدى موافقتك أو عدم موافقتك على العبارات التالية فيما يتعلق (بالقدرة على الاتصال بالاخرين) بالنقر حيث ما تراه مناسبًا.

القدرة على الاتصال بالاخرين

العبارة	لا أوافق بشدة	لا أوافق إلى حد ما	لا أوافق ولا أرفض	أوافق إلى حد ما	موافق بشدة
نحن نطابق استخدام الموارد (مثل الموظفين والشؤون المالية) بعلاقة العمل.					
نقوم بتعيين المنسقين المسؤولين عن العلاقات مع شركائنا.					
لدينا القدرة على بناء علاقات شخصية جيدة مع شركاء الأعمال.					
يمكننا أن نضع أنفسنا في موقف شركائنا.					
نحن نعرف منتجات / إجراءات / خدمات شركائنا.					

س 13: يرجى الإشارة إلى مدى موافقتك أو عدم موافقتك على العبارات التالية فيما يتعلق (بالابتكار) بالنقر حيث ما تراه مناسبًا.

الابتكار

العبارة	لا أوافق بشدة	لا أوافق إلى حد ما	لا أوافق ولا أرفض	أوافق إلى حد ما	موافق بشدة
نقدم بنشاط تحسينات وابتكارات في أعمالنا.					
عملنا مبدع في أساليب عمله.					
يبحث عملنا عن طرق جديدة للقيام بالأشياء.					
الرجاء الإجابة بلا أوافق بشدة على هذا البيان.					

الجزء 7 : الكفاءة الذاتية

س 14: يرجى الإشارة إلى مدى موافقتك أو عدم موافقتك على العبارات التالية فيما يتعلق (بالكفاءة الذاتية) بالنقر حيث ما تراه مناسبًا.

الكفاءة الذاتية

العبارة	لا أوافق بشدة	لا أوافق إلى حد ما	لا أوافق ولا أرفض	أوافق إلى حد ما	موافق بشدة
سأكون قادراً على تحقيق معظم الأهداف التي حددتها لنفسي.					
عند مواجهة مهام صعبة ، أنا متأكد من أنني سأحققها.					
بشكل عام ، أعتقد أنه يمكنني تحقيق النتائج التي تهمني.					
أعتقد أنني أستطيع أن أنجح في أي مسعى تقريبًا أفكر فيه.					
سأكون قادراً على التغلب على العديد من التحديات بنجاح.					

شكرا لكم على مشاركتكم. نحن حقا نقدر وقتك و اجاباتك

نود أيضًا أن نطلب منك مشاركة رابط الاستبيان هذا مع الأشخاص الذين ذكرتهم في هذا الاستطلاع ، وليس مع الآخرين. **أيضًا** ، **يرجى عدم المشاركة في الاستطلاع إذا تلقيته مرة أخرى.**

عنوان بريدك الإلكتروني (اختياري) [ ] سيتم استخدام بريدك الإلكتروني فقط لإرسال تذكير لك لإكمال الاستبيان أو يطلب منك تذكير الأشخاص الذين رشحتهم لإكماله. لن يتم تخزين عنوان بريدك الإلكتروني وسيتم حذفه قبل إجراء التحليل.

شكرا جزيلا

محمود زكارنة

Survey (Turkish version)

<u>Bölüm 1: Ön Yazı</u>

Sevgili Beyefendi / Hanımefendi,

Dijital teknolojinin sağladığı, birlikte -yeni bir- değer yaratma sürecinin performans etkilerini gözlemlemleyen bir çalışmaya davetlisiniz (yani, iş ağı üyeleri tarafından hizmet / ürün yeniliği için kullanılan dijital etkileşim platformları). Ankete katılmayı kabul ettiğiniz takdirde, sizden iş ağınızda düzenli bir biçimde etkileşim içinde bulunduğunuz kişiler hakkında sorulan soruları yanıtlamanız istenecek. “Örneğin; Lütfen şirketlerinin isimlerini belirterek iş ağınızda sizin için önemli olan en fazla 10 kişi belirleyiniz.” Belirleyeceğiniz kişilerin her birinin şirketinizin dışında ve farklı şirketlerde çalışan kişiler olmasına dikkat ediniz.

<u>Vermiş olduğunuz bilgiler işlenip analiz edilirken sizin ve belirlediğiniz kişilerin şirketlerinin isimleri herhangi bir bulguda tanımlanmayacaktır.</u>

Bütün şirketlerin isimleri alfanümerik kodlarla değiştirilecektir. Örneğin; Y şirketinden bir kişi ile iletişim kuran ve X şirketi için çalışan kişi 1, (A1) olarak kodlanacak olup, Y şirketi ise (A2) olarak kodlanacak vb. … **<u>Araştırma projesi kişisel bilgi toplamayacaktır.</u>** Biz sadece katılımcıların örgütsel süreç ve yapılarına ilişkin görüşleri ve algıları ile ilgileniyoruz. Bireysel yorumlar verilen takma isimlerle (yukarıdaki örneğe bakınız) anonimleştirileceğinden şirket ve katılımcıların kimliklerinin (doğrudan veya dolaylı olarak)belirlenebilmesi mümkün olmayacaktır. Cevapların doğru ya da yanlış olarak nitelendirilmeyeceğini unutmayınız.

Bu anketi doldurmanız yaklaşık 10-15 dakikanızı alacaktır. Umarım dürüstçe cevaplarsınız.

Etik onayı, Kent Business School’un etik komitesi tarafından verildi. Daha fazla bilgiye ihtiyacınız olursa veya bir etik onay numarası talep ederseniz, lütfen aşağıdaki araştırmacıyla iletişime geçmekten çekinmeyin.

İş birliğiniz için teşekkürler…

Mahmoud Zakarneh

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WhatsApp: *************************

Bölüm 2: İzin/Rıza

C1. Yanıtlarımın analiz edilmeden önce anonimleştirileceğini anlıyorum☐

C2. Yukarıdaki araştırma projesine katılmayı kabul ediyorum ☐

C3. Bu ankete daha önce katıldınız mı? Evet ☐ Hayır ☐

Bölüm 3: Firmaografik veriler ve katılımcı bilgileri

C4. Çalıştığınız şirketin adı nedir?

…………………………………………………………………………

C5. Hangi lokasyonda çalışıyorsunuz? (ülke adı)

…………………………………………………………………………

S1.Lütfen aşağıdan şirketinizin temel teklifiyle ilgili olan seçeneği seçiniz:

Ürünler ☐ Hizmetler ☐

S2. Şirketinizinde çalışan kişi sayısı nedir?

10'dan daha az çalışan	☐
10 ila 49 çalışan	☐
50 ila 249 çalışan	☐
250'den fazla çalışan	☐

S3. Çalıştığınız şirket ne zamandır faaliyet gösteriyor?

3 yıldan az	☐
3 yıldan fazla, 5 yıldan az	☐
5 yıldan fazla, 7yıldan az	☐
7 yıldan fazla, 9 yıldan az	☐
9 yıldan fazla, 11 yıldan az	☐
11 yıl ve daha fazla	☐

S4. Hangi departmanda çalışıyorsunuz?

Üretim	☐
Araştırma ve Geliştirme (Ar-Ge)	☐
Satın Alma	☐
Pazarlama (satış işlevi ve müşteri hesap yöneticisi dahil)	☐
İnsan Kaynakları (İK)	☐
Muhasebe	☐
Finans (Maliye)	☐
Operasyon Bölümü	☐
Kalite Güvencesi	☐
Bilgi Teknolojisi (BT)	☐
Lojistik	☐
Diğer (Belirtiniz lütfen)…	☐

S5. Aşağıda verilen seçeneklerden mevcut iş seviyenize en uygun olanı hangisidir?

İş Sahibi/Yönetici	☐
Üst düzey yönetim	☐
Orta yönetim	☐
Orta düzey	☐
Giriş seviyesi	☐
Diğer (Belirtiniz lütfen)…	☐

Bölüm 4: İş Bağlantıları

S6. Lütfen (şirketinizin dışında çalışan) iş ağınız için önemli olan en fazla 10 kişiyi (çalıştıkları şirketin isminden de bahsederek) tanımlayınız. Tanımlayacağınız bu kişiler size; işinizi yapmanız için bilgi sağlayan, işinizin neden olduğu karmaşık sorunlar hakkında düşünmenize yardımcı olan veya günlük çalışma hayatınızda yardımcı olacak gelişimsel tavsiyeler yahut kişisel destek sağlayan kişilerden olabilir. Tanımlayacağınız bu insanlar,düzenli olarak iletişim halinde olduğunuz veya olmadığınız kişilerden olabilir.

Kişi 1 …………………………………………………………………………

Kişi 2 …………………………………………………………………………

Kişi 3 …………………………………………………………………………

Kişi 4…………………………………………………………………………

Kişi 5 …………………………………………………………………………

Kişi 6 …………………………………………………………………………

Kişi 7 …………………………………………………………………………

Kişi 8 …………………………………………………………………………

Kişi 9 …………………………………………………………………………

Kişi 10 ………………………………………………………………………

S7.Lütfen uygun gördüğünüz şekilde işaretleyiniz.

Yenilik bağları

Açıklama	Kişi 1	Kişi 2	Kişi 3	Kişi 4	Kişi 5	Kişi 6	Kişi 7	Kişi 8	Kişi 9	Kişi 10
Yeni veya yenilikçi bir fikri tartışmak için muhtemelen kime başvurursunuz?										
Yeni veya yenilikçi bir fikri tartışmak için kim size yönelebilir?										

Bölüm 5: Diyalog, Erişim, Risk / fayda değerlendirmesi ve Şeffaflık

Bu bölüm, iş ağınızda kullandığınız dijital etkileşim platformuyla ilgili değişkenleri içerir.

S8. İşbirliği içinde olduğunuz çalışma arkadaşlarınızla ilgili verilen ifadelere ne ölçüde katıldığınızı veya katılmadığınızı uygun gördüğünüze tıklayarak belirtiniz.

Diyalog

Açıklama	Kesinlikle katılmıyorum	Katılmıyorum	Ne katılıyorum ne katılmıyorum	Katılıyorum	Kesinlikle katılıyorum
İş birliği içinde olduğumuz çalışma arkadaşlarımızla temas kurmak için çeşitli iletişim kanalları kullanırız.					
İş birliği içinde olduğumuz çalışma arkadaşlarımızla sık sık toplantı oturumları düzenleriz.					
İş birliği içinde olduğumuz çalışma arkadaşlarımızla yaptığımız toplantı oturumlarımıza iç çalışanlarımızı da dahil ederiz.					
İş birliği içinde olduğumuz çalışma arkadaşlarımızla yaptığımız toplantı oturumlarımıza şirket dışında çalışan iş arkadaşlarımızı da dahil ederiz.					
İş birliği içinde olduğumuz çalışma arkadaşlarımızın hizmet ve / veya ürünlerimizle ilgili deneyimlerini takdir ederiz.					
İş birliği içinde olduğumuz çalışma arkadaşlarımızın göstermiş oldukları çabanın ne kadar değerli olduğunu onlara gösteririz.					

S9. Aşağıda yer alan kaynaklara erişimle ile ilgili ifadelerden uygun bulduğunuz seçeneğe tıklayarak bu ifadelere ne ölçüde katıldığınızı veya katılmadığınızı belirtiniz.

Kaynaklara erişim

Açıklama	Kesinlikle katılmıyorum	Katılmıyorum	Ne katılıyorum ne katılmıyorum	Katılıyorum	Kesinlikle katılıyorum
İş birliği içinde olduğumuz çalışma arkadaşlarımıza, hizmet ve / veya ürünlerin tasarım sürecini paylaşma imkanı sunarız.					
İş birliği içinde olduğumuz çalışma arkadaşlarımıza, hizmet ve / veya ürünlerin geliştirme sürecini paylaşma imkanı sunarız.					
İş birliği içinde olduğumuz çalışma arkadaşlarımıza, hizmet ve / veya ürünlerin fiyat belirleme sürecini paylaşma imkanı sunarız.					
İşbirliği içinde olduğumuz çalışma arkadaşlarımıza sağlayacağımız deneyimi onların bu hizmet ve / veya ürünlere sahip olmalarından daha çok önemseriz.					
İşbirliği içinde olduğumuz çalışma arkadaşlarımıza hizmet ve / veya ürünle ilgili gereken tüm bilgileri sağlarız.					

S10. Aşağıda yer alan risk / fayda değerlendirmesiyle ile ilgili ifadelerden uygun bulduğunuz seçeneğe tıklayarak bu ifadelere ne ölçüde katıldığınızı veya katılmadığınızı belirtiniz.

Risk / Fayda değerlendirmesi

Açıklama	Kesinlikle katılmıyorum	Katılmıyorum	Ne katılıyorum ne katılmıyorum	Katılıyorum	Kesinlikle katılıyorum
Sunulan hizmetlerin ve / veya ürünlerin olası riskleri hakkında iş birliği içinde olduğumuz çalışma arkadaşlarımızı bilgilendiririz.					
Firmanın bilgi ve kabiliyetinin sınırlandırılması hakkında iş birliği içinde olduğumuz çalışma arkadaşlarımızı bilgilendiririz.					
İş birliği içinde olduğumuz çalışma arkadaşlarımızın ihtiyaçlarının değişen dinamiklerinin farkındayız.					
İş birliği içinde olduğumuz çalışma arkadaşlarımızın hizmet ve / veya ürün teklifleriyle ilgili şikayetlerini kabul ederiz.					
Riskle ilgili tüm sorumlulukları üstleniriz.					

S11. Aşağıda yer alan şeffaflık ile ilgili ifadelerden uygun bulduğunuz seçeneğe tıklayarak bu ifadelere ne ölçüde katıldığınızı veya katılmadığınızı belirtiniz.

Şeffaflık

Açıklama	Kesinlikle katılmıyorum	Katılmıyorum	Ne katılıyorum ne katılmıyorum	Katılıyorum	Kesinlikle katılıyorum
Hizmet ve / veya ürünle ilgili bilgileri iş birliği içinde olduğumuz çalışma arkadaşlarımıza açıklarız.					
Fiyatlandırma hakkındaki bilgileri iş birliği içinde olduğumuz çalışma arkadaşlarımıza açıklarız.					
Firma ve iş birliği içinde olduğumuz çalışma arkadaşlarımız arasındaki bilgi simetrisinden yararlanırız.					
İş birliği içinde olduğumuz çalışma arkadaşlarımız arasındaki güveni şeffaf bilgiler aracılığıyla inşa ederiz.					
İş birliği içinde olduğumuz çalışma arkadaşlarımıza güncel bilgiler sağlarız.					

<u>Bölüm 6: Ağ oluşturma yeteneği ve Yenilikçilik</u>

S12. Aşağıda yer alan ağ oluşturma özelliği ile ilgili ifadelerden uygun bulduğunuz seçeneğe tıklayarak bu ifadelere ne ölçüde katıldığınızı veya katılmadığınızı belirtiniz.

İş Ağı oluşturma yeteneği (kabiliyeti)

Açıklama	Kesinlikle katılmıyorum	Katılmıyorum	Ne katılıyorum ne katılmıyorum	Katılıyorum	Kesinlikle katılıyorum
Kaynak kullanımını (örneğin; kişisel, mali) iş ilişkisiyle eşleştiririz.					
İşbirliği içinde olduğumuz çalışma arkadaşlarımız için onlarla kurulan ilişkilerden sorumlu koordinatörler atarız.					
İşbirliği içinde olduğumuz çalışma arkadaşlarımızla iyi kişisel ilişkiler kurma yeteneğine sahibiz.					
Kendimizi iş birliği içinde olduğumuz çalışma arkadaşlarımızın yerine koyabiliriz.					
İşbirliği içinde olduğumuz çalışma arkadaşlarımızın ürünlerini / prosedürlerini / hizmetlerini biliriz.					

S.13 Aşağıda yer alan yenilikçiliğe ilişkin ifadelerden uygun bulduğunuz seçeneğe tıklayarak bu ifadelere ne ölçüde katıldığınızı veya katılmadığınızı belirtiniz.

Yenilikçilik

Açıklama	Kesinlikle katılmıyorum	Katılmıyorum	Ne katılıyorum ne katılmıyorum	Katılıyorum	Kesinlikle katılıyorum
İşletmemizdeki iyileştirme ve yenilikleri aktif bir biçimde tanımlarız.					
İşletmemiz, çalışma yöntemlerinde yaratıcıdır.					
İşletmemiz bir şeyler yapmanın yeni yollarını arar.					
Lütfen bu ifade için kesinlikle katılmıyorum cevabını verin.					

<u>Bölüm 7: Öz Yeterlilik</u>

S14. Aşağıda yer alan öz yeterlilik ile ilgili ifadelerden uygun bulduğunuz seçeneğe tıklayarak bu ifadelere ne ölçüde katıldığınızı veya katılmadığınızı belirtiniz.

Öz Yeterlilik

Açıklama	Kesinlikle katılmıyorum	Katılmıyorum	Ne katılıyorum ne katılmıyorum	Katılıyorum	Kesinlikle katılıyorum
Kendim için belirlediğim hedeflerin çoğuna ulaşabileceğim.					
Karşılaştığım zor görevleri başaracağıma eminim.					
Genellikle, benim için önemli olan sonuçlara ulaşabileceğimi düşünüyorum.					
Aklıma koyduğum hemen hemen her uğraşıda başarılı olabileceğime inanıyorum.					
Pek çok zorluğun üstesinden başarıyla gelebileceğim.					

Katıldığınız için teşekkürler. Zamanınıza ve veri girdinize gerçekten değer veriyoruz

Ayrıca sizden bu anket bağlantısını başkalarıyla değil, yalnızca bu ankette **bahsettiğiniz kişilerle** paylaşmanızı rica ediyoruz. **Lütfen tekrar alsanız bile bu ankete katılmayınız**.

E-posta adresiniz (isteğe bağlı) ______ Bu sadece anketi tamamlamanız için size bir hatırlatma göndermek veya anketi doldurmaları için aday gösterdiğiniz kişilere hatırlatma yapmanızı istemek için kullanılacaktır. E-posta adresiniz saklanmayacak ve analiz yapılmadan önce silinecektir.

Saygılarımla
Mahmoud Zakarneh

Appendix 10: Definitions of the goodness-of-fit indices used in this research.

Fit index	Definition/Description
X^2	indicates the discrepancy between observed and expected covariance matrices.
GFI	*"is an absolute fit index that estimates the proportion of covariances in the sample data matrix explained by the model. That is, the GFI estimates how much better the researcher's model fits compared with no model at all"* (Kline, 2011, p. 207).
CFI	"measures the relative improvement in the fit of the researcher's model over that of a baseline model, typically the independence model" (Kline, 2011, p. 208).
TLI	*"a combination of a measure of parsimony with a comparative index between the proposed model and the null model"* (Sarmento and Costa, 2019, p. 8).
IFI	Addresses the issues of parsimony and sample size where df are taken into consideration (Byrne, 2010, p. 79).
RMSEA	*"is a measure that attempts to correct the tendency of chi-square statistics to reject models with large samples. It avoids issues of sample size by analyzing the discrepancy between the proposed model, with optimally chosen parameter estimates, and the population covariance matrix*" (Sarmento and Costa, 2019, p. 8).
SRMR	*"is based on transforming both the sample covariance matrix and the predicted covariance matrix into correlation matrices. The SRMR is thus a measure of the mean absolute correlation residual, the overall difference between the observed and predicted correlations."* (Kline, 2011, p. 209).

Note: X^2 = Chi-Square; df = degrees of freedom; GFI = goodness of fit index; CFI = comparative fit index; TLI = Tucker Lewis index; IFI = incremental fit index; RMSEA = root mean square error of approximation; SRMR = standardised root mean residual.

Appendix 11: Constructs' measurements.

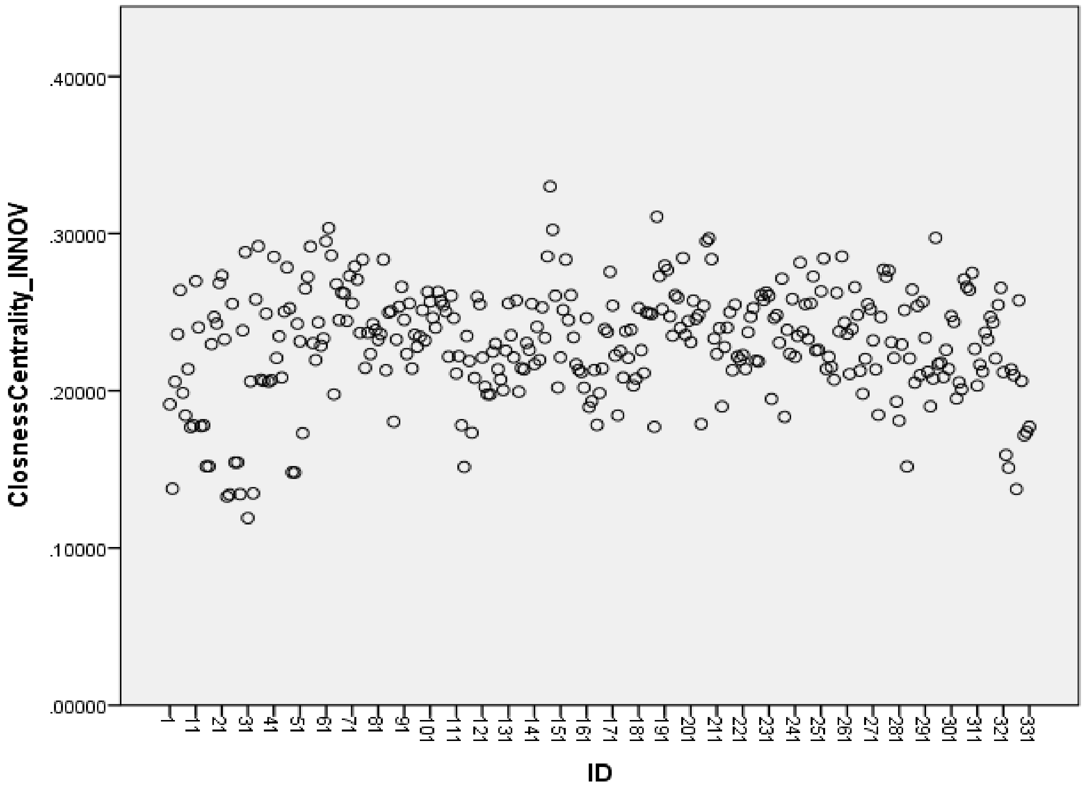
Construct	Definition	Items
Networking Capability (Zhang *et al.*, 2015) (7-point Likert Scale, 1 = Strongly Disagree, 7 = Strongly Agree).	*""Mu et al. (2016) define networking capability "as the competency of a firm to purposefully search and find network partners, manage and leverage network relationships for value creation"* (Nordin *et al.*, 2018, p. 91).	1.We match the use of resources (e.g., personnel, finances) to the business relationship. 2.We appoint coordinators who are responsible for the relationships with our partners. 3.We have the ability to build good personal relationships with business partners. 4.We can put ourselves in our partners' position. 5.We know our partners' products/procedures/services.
Dialogue (Taghizadeh *et al.*, 2016) (5-point Likert Scale, 1 = Strongly Disagree, 5 = Strongly Agree).	Dialogue is essential to build a common understanding among the actors through facilitating free and open communications. Dialogue denotes the *"interactivity, deep engagement, and the ability and willingness to act on both sides"* (Prahalad and Ramaswamy, 2004, p. 9).	1.Use diversified communication channels to have dialogue sessions with consumers 2.Conduct dialogue session with consumer frequently 3.Involve internal parties during the dialogue session with consumers 4.Involve external parties during the dialogue session with consumers 5.Recognise the consumer's experience regarding to the service product 6.Emphasise the employees' effort to individual consumers
Access (Taghizadeh *et al.*, 2016) (5-point Likert Scale, 1 = Strongly Disagree, 5 = Strongly Agree).	Indicates the availability and reach of resources, knowledge, and information for the participating actors in the value co-creation process (Prahalad and Ramaswamy, 2004).	1.Offer opportunity to the consumers to share in the design process of service product 2.Offer opportunity to the consumers to share in the development process of service product 3.Offer opportunity to the consumers to share in the setting price process of service product 4.Emphasise more on providing experiences to the consumers than the ownership of service product 5.Provide all the necessary service product-related information to the consumers

Table continues

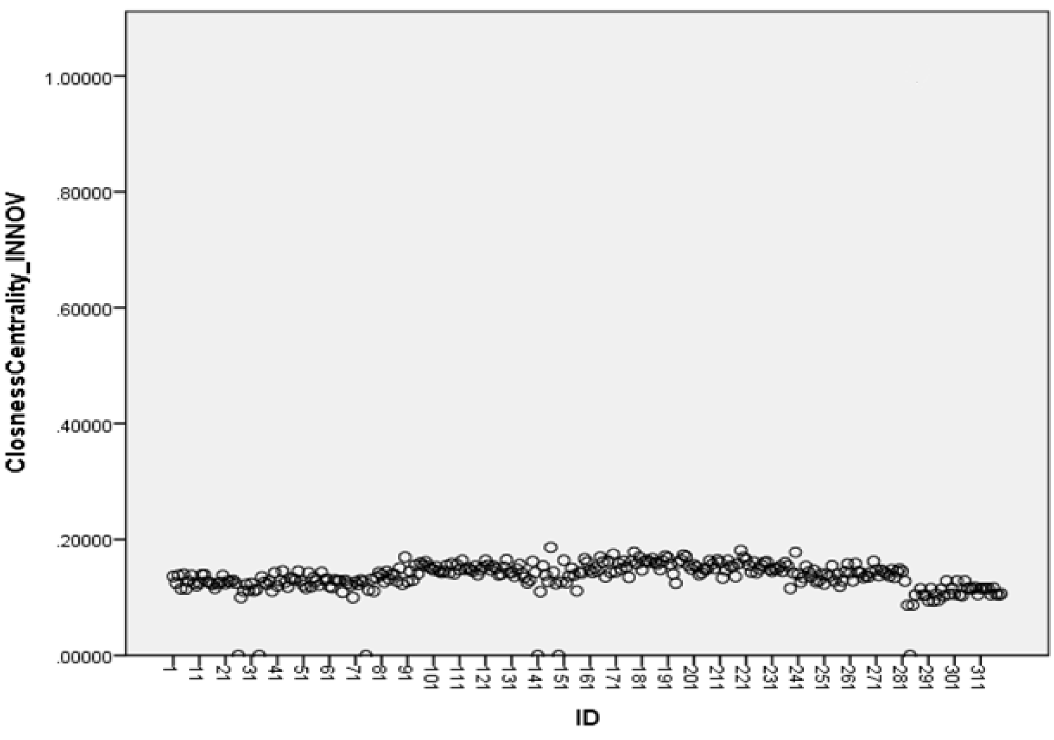
Appendix 11 (Continued)

Construct	Definition	Items
Risk/Benefit assessment (Taghizadeh *et al.*, 2016) (5-point Likert Scale, 1 = Strongly Disagree, 5 = Strongly Agree).	The assessment of the risks and benefits accompanied by product (goods, services, and ideas), and economic transactions (Prahalad and Ramaswamy, 2004).	1.Inform potential risks of the service product offered to the consumers 2.Inform consumers about the limitation of the firm's knowledge and capability 3.Recognise the changing dynamics of consumers' need 4.Accept the consumers' complaints on service product offerings 5.Shoulder all the risk-related responsibilities upon themselves
Transparency (Taghizadeh *et al.*, 2016) (5-point Likert Scale, 1 = Strongly Disagree, 5 = Strongly Agree).	Refers to the condition where the actor is being transparent. Transparency represents the openness and information asymmetry among the engaged actors in value co-creation process (Prahalad and Ramaswamy, 2004).	1.Make clear to the consumers about the service product-related information 2.Disclose pricing related information to the consumers 3.Get benefit from the information symmetry between the consumers and the firm 4.Build trust among the consumers through transparent information 5.Provide up-to-date information to consumers
Innovativeness (Hughes and Morgan, 2007) (7-point Likert Scale, 1 = Strongly Disagree, 7 = Strongly Agree).	*"Firm innovativeness represents a firm's overall capability to introduce new products and services into the market or set up new markets via the introduction of strategies oriented towards the firm's overall innovation mission (Wang and Ahmed, 2004)."* (Adomako, Amankwah-Amoah and Danso, 2019, p. 3).	1.We actively introduce improvements and innovations in our business. 2.Our business is creative in its methods of operation. 3.Our business seeks out new ways to do things.
In-degree centrality (Wasserman and Faust, 1994)	In-degree centrality (i.e., relationships directed towards the actor, allows the identification of which actor in the business network attracting more resources from the network more than others do (Klepac, Kopal and Mri, 2014).	The count of the number of ties directed to the node (the actor) (Measures will be obtained from SNA) DC (ni) = $\sum Xij$
Closeness centrality (Wasserman and Faust, 1994)	Refers to the actor's proximity to other actors i.e., the degree an actor is near all other actors (directly or indirectly) in the business network (Klepac, Kopal and Mri, 2014).	CC(x)= $\frac{1}{\sum_y d(y,x)}$ CC= Closeness Centrality d(y,x) = The distance between actor x and actor y (Measures will be obtained from SNA)

Appendix 12: Closeness centrality outlier inspection – FMCG business network.



Appendix 13: Closeness centrality outlier inspection – Hospitality business network.



Appendix 14: FMCG business network descriptive statistics, skewness, and kurtosis.

Items	N	Mean	Std. Deviation	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
NC1	331	3.82	0.762	-0.667	0.134	1.104	0.267
NC2	331	3.7	0.75	-0.361	0.134	0.427	0.267
NC3	331	3.7	0.823	-0.546	0.134	0.523	0.267
NC4	331	3.72	0.715	-0.427	0.134	0.452	0.267
NC5	331	3.69	0.761	-0.241	0.134	0.011	0.267
D1	331	3.87	0.784	-0.761	0.134	0.96	0.267
D2	331	3.88	0.716	-0.865	0.134	2.055	0.267
D3	331	3.84	0.734	-0.67	0.134	1.402	0.267
D4	331	3.87	0.701	-0.607	0.134	1.347	0.267
D5	331	3.92	0.721	-0.603	0.134	1.188	0.267
D6	331	3.28	0.873	-0.2	0.134	-0.666	0.267
A1	331	4.05	0.697	-1.25	0.134	3.774	0.267
A2	331	3.9	0.724	-0.623	0.134	1.202	0.267
A3	331	3.94	0.726	-1.203	0.134	2.894	0.267
A4	331	3.77	0.765	-0.927	0.134	1.594	0.267
A5	331	3.82	0.717	-0.604	0.134	1.126	0.267
R1	331	2.94	0.884	0.298	0.134	-0.757	0.267
R2	331	3.2	0.908	-0.032	0.134	-0.743	0.267
R3	331	3.1	0.905	-0.056	0.134	-0.94	0.267
R4	331	3.15	0.928	-0.145	0.134	-0.835	0.267
R5	331	2.98	0.893	0.081	0.134	-0.695	0.267
T1	331	2.99	1.08	0.366	0.134	-0.945	0.267
T2	331	3.02	1.116	0.154	0.134	-0.929	0.267
T3	331	2.88	1.052	0.479	0.134	-0.713	0.267
T4	331	2.94	1.149	0.33	0.134	-0.93	0.267
T5	331	2.9	1.114	0.436	0.134	-0.794	0.267
INNS1	331	3.32	1.074	-0.037	0.134	-0.992	0.267
INNS2	331	3.58	0.967	-0.511	0.134	-0.221	0.267
INNS3	331	3.28	1.21	-0.002	0.134	-1.215	0.267

Appendix 15: Hospitality business network descriptive statistics, skewness, and kurtosis.

Items	N	Mean	Std. Deviation	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
NC1	319	3.77	0.762	-0.738	0.137	1.159	0.272
NC2	319	3.69	0.758	-0.454	0.137	0.478	0.272
NC3	319	3.67	0.818	-0.602	0.137	0.584	0.272
NC4	319	3.69	0.693	-0.577	0.137	0.683	0.272
NC5	319	3.67	0.775	-0.287	0.137	-0.004	0.272
D1	319	3.85	0.789	-0.775	0.137	0.937	0.272
D2	319	3.85	0.733	-0.867	0.137	1.835	0.272
D3	319	3.83	0.747	-0.71	0.137	1.358	0.272
D4	319	3.82	0.71	-0.69	0.137	1.385	0.272
D5	319	3.92	0.713	-0.664	0.137	1.432	0.272
D6	319	3.25	0.854	-0.231	0.137	-0.686	0.272
A1	319	4.05	0.723	-1.376	0.137	4.046	0.272
A2	319	3.93	0.747	-1.121	0.137	2.677	0.272
A3	319	3.9	0.752	-0.908	0.137	1.826	0.272
A4	319	3.8	0.768	-0.931	0.137	1.686	0.272
A5	319	3.78	0.724	-0.592	0.137	1.019	0.272
R1	319	2.9	0.872	0.247	0.137	-0.84	0.272
R2	319	3.16	0.877	-0.092	0.137	-0.759	0.272
R3	319	3.09	0.91	-0.074	0.137	-0.92	0.272
R4	319	3.13	0.923	-0.175	0.137	-0.884	0.272
R5	319	2.96	0.886	0.101	0.137	-0.66	0.272
T1	319	2.97	1.077	0.36	0.137	-0.971	0.272
T2	319	3.02	1.094	0.172	0.137	-0.902	0.272
T3	319	2.86	1.047	0.434	0.137	-0.709	0.272
T4	319	2.91	1.154	0.321	0.137	-0.938	0.272
T5	319	2.87	1.096	0.503	0.137	-0.706	0.272
INNS1	319	3.32	1.083	-0.028	0.137	-1.017	0.272
INNS2	319	3.58	0.935	-0.63	0.137	0.035	0.272
INNS3	319	3.28	1.172	0.003	0.137	-1.135	0.272

Appendix 16: Results of exploratory factor analysis – FMCG business network (n=331).

Construct			Item	Factor loading
Networking Capability (NC) Eigenvalue = 1.915 (7.659%), reliability α=0.903	1	NC1	We match the use of resources (e.g., personnel, finances) to the business relationship.	0.837
	2	NC2	We appoint coordinators who are responsible for the relationships with our partners.	0.880
	3	NC3	We have the ability to build good personal relationships with business partners.	0.771
	4	NC4	We can put ourselves in our partners' position.	0.849
Dialogue (D) Eigenvalue = 2.475 (9.9 %), reliability α= 0.893	1	D1	We use diversified communication channels to have dialogue sessions with our partners.	0.797
	2	D2	We conduct dialogue sessions with our partners frequently.	0.831
	3	D3	We involve internal parties during the dialogue sessions with our partners.	0.842
	4	D4	We involve external parties during the dialogue sessions with our partners.	0.820
	5	D5	We recognise our partners' experience regarding our services and/or products.	0.647
Access (A) Eigenvalue = 1.544 (6.175 %), reliability α= 0.849	1	A3	We offer opportunities to our partners to share in the price setting process of services and/or products.	0.908
	4	A4	We emphasise more the provision of experiences to our partners than the ownership of services and/or products.	0.764
	5	A5	We provide all the necessary service and/or product-related information to our partners.	0.733
Risk (R) Eigenvalue = 2.951 (11.804 %), reliability α= 0.897	1	R1	We inform about potential risks of the services and/or products offered to our partners.	0.797
	2	R2	We inform our partners about the limitation of the firm's knowledge and capability.	0.754
	3	R3	We recognise the changing dynamics of our partners' needs.	0.882
	4	R4	We accept our partners' complaints about service and/or product offerings.	0.864
	5	R5	We shoulder all the risk-related responsibilities ourselves.	0.674
Transparency (T) Eigenvalue = 8.154 (32.615 %), reliability α= 0.898	1	T1	We clarify service and/or product-related information to our partners.	0.700
	2	T2	We disclose pricing-related information to our partners.	0.812
	3	T3	We get benefit from the information symmetry between our partners and the firm.	0.845
	4	T4	We build trust among partners through transparent information.	0.862
	5	T5	We provide up-to-date information to our partners.	0.772
Innovativeness (INNS) Eigenvalue = 1.267 (5.068 %), reliability α= 0.793	1	INNS1	We actively introduce improvements and innovations in our business.	0.733
	2	INNS2	Our business is creative in its methods of operation.	0.679
	3	INNS3	Our business seeks out new ways to do things.	0.812

Note: Kaiser-Meyer-Olkin measure of sampling adequacy = .897; Bartlett`s test of sphericity (X^2 = 4932.409. df= 300, *p* value=0.000).
X^2= Chi-square; n= sample size; α= Cronbach`s alpha; df= degrees of freedom; *p*-value = probability value.

Appendix 17: Results of exploratory factor analysis – Hospitality business network (n=319).

Construct			Item	Factor loading
Networking Capability (NC) Eigenvalue = 1.949 (7.795 %), reliability α=0.896	1	NC1	We match the use of resources (e.g., personnel, finances) to the business relationship.	0.813
	2	NC2	We appoint coordinators who are responsible for the relationships with our partners.	0.904
	3	NC3	We have the ability to build good personal relationships with business partners.	0.745
	4	NC4	We can put ourselves in our partners' position.	0.831
Dialogue (D) Eigenvalue = 8.053 (32.213 %), reliability α= 0.905	1	D1	We use diversified communication channels to have dialogue sessions with our partners.	0.784
	2	D2	We conduct dialogue sessions with our partners frequently.	0.855
	3	D3	We involve internal parties during the dialogue sessions with our partners.	0.882
	4	D4	We involve external parties during the dialogue sessions with our partners.	0.837
	5	D5	We recognise our partners' experience regarding our services and/or products.	0.670
Access (A) Eigenvalue = 1.335 (5.339 %), reliability α= 0.821	1	A2	We offer opportunities to our partners to share in the development process of services and/or products.	0.683
	4	A4	We emphasise more the provision of experiences to our partners than the ownership of services and/or products.	0.795
	5	A5	We provide all the necessary service and/or product-related information to our partners.	0.800
Risk (R) Eigenvalue = 2.559 (10.236 %), reliability α= 0.893	1	R1	We inform about potential risks of the services and/or products offered to our partners.	0.784
	2	R2	We inform our partners about the limitation of the firm's knowledge and capability.	0.716
	3	R3	We recognise the changing dynamics of our partners' needs.	0.863
	4	R4	We accept our partners' complaints about service and/or product offerings.	0.895
	5	R5	We shoulder all the risk-related responsibilities ourselves.	0.678
Transparency (T) Eigenvalue = 3.158 (12.631 %), reliability α= 0.896	1	T1	We clarify service and/or product-related information to our partners.	0.694
	2	T2	We disclose pricing-related information to our partners.	0.816
	3	T3	We get benefit from the information symmetry between our partners and the firm.	0.828
	4	T4	We build trust among partners through transparent information.	0.854
	5	T5	We provide up-to-date information to our partners.	0.778
Innovativeness (INNS) Eigenvalue = 1.159 (4.636 %), reliability α= 0.789	1	INNS1	We actively introduce improvements and innovations in our business.	0.789
	2	INNS2	Our business is creative in its methods of operation.	0.686
	3	INNS3	Our business seeks out new ways to do things.	0.738

Note: Kaiser-Meyer-Olkin measure of sampling adequacy = .895; Bartlett`s test of sphericity (X^2 = 4744.227. df= 300, *p* value=0.000).
X^2= Chi-square; n= sample size; α= Cronbach`s alpha; df= degrees of freedom; *p*-value = probability value.

Appendix 18: Factor correlation matrix – FMCG business network (n=331).

Factor	T	R	D	NC	A	INNS
T	1					
R	0.340	1				
D	0.223	0.335	1			
NC	0.351	0.474	0.368	1		
A	0.266	0.411	0.395	0.451	1	
INNS	**0.528**	0.364	0.378	0.301	0.337	1

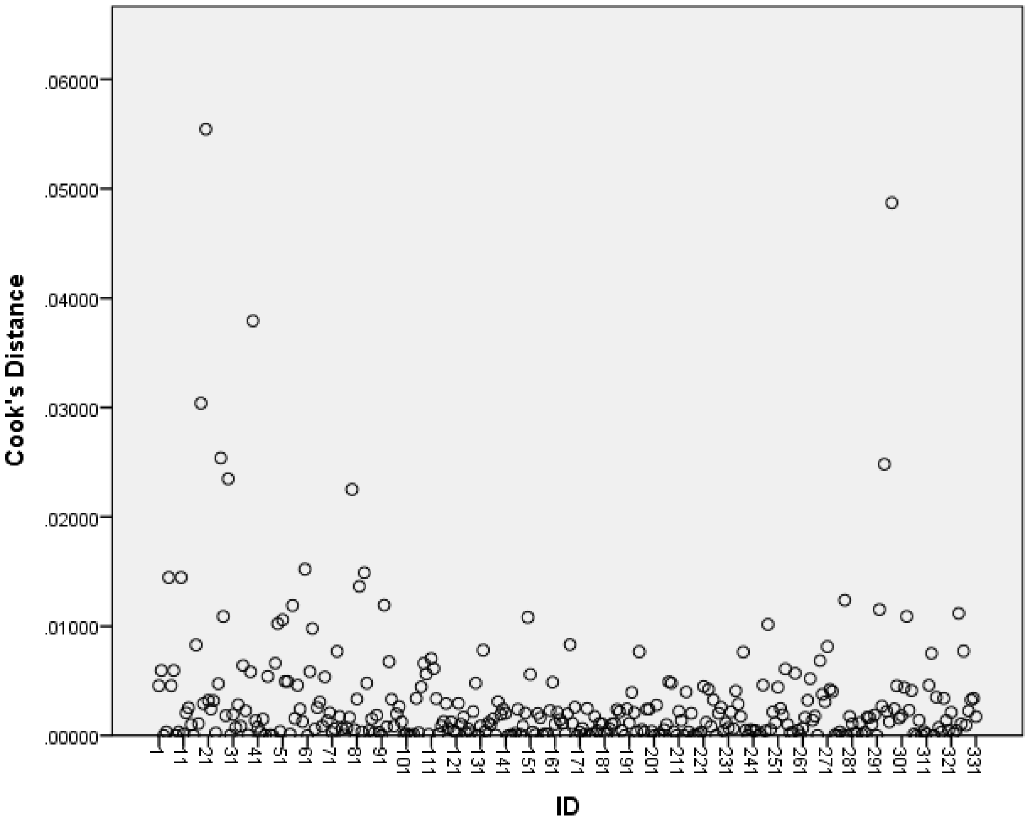
Note: Extraction method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalisation.
n = 331; NC= Networking Capability; D = Dialogue; A = Access; R = Risk/benefit assessment; T = Transparency; INNS = Innovativeness.

Appendix 19: Factor correlation matrix – Hospitality business network (n=319).

Factor	D	T	R	NC	A	INNS
D	1					
T	0.175	1				
R	0.295	0.300	1			
NC	0.363	0.326	0.463	1		
A	0.487	0.259	0.437	**0.548**	1	
INNS	0.367	0.505	0.366	0.291	0.377	1

Note: Extraction method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalisation.
n = 331; NC= Networking Capability; D = Dialogue; A = Access; R = Risk/benefit assessment; T = Transparency; INNS = Innovativeness.

Appendix 20: Cook`s distance – FMCG business network.



Appendix 21: Cook`s distance – Hospitality business network.