Digitalization and co-creation of healthcare value: a case study in Occupational Health

Abstract

This paper discusses how digitalization of healthcare empowers stakeholders to interact and co-create value. The literature so far has focused on the benefits of healthcare value co-creation through digital technologies (DTs) from the patients and providers' perspective. It has viewed patients and providers *in isolation* focusing on the benefits accruing to the healthcare system but has not shed light upon the role of DT during *interactions* between stakeholders to co-create healthcare value. To address this gap, this research uses a case of the 'Occupational Health Adviceline' (OHA), a DT-enabled Occupational Health (OH) service introduced in England to provide support and advice to Small and Medium Enterprises (SMEs). We draw upon the affordances and S-D Logic concepts to illustrate how technology enables stakeholder (employees, employers, and contact centre advisors and OH nurses) empowerment and allows them to interact and co-create healthcare value. Our contribution lies in discussing the importance of DTs through the affordances and S-D Logic lenses in how digitalization facilitates value co-creation through empowering stakeholders while providing new forms of visibility management.

Keywords: Digitalization, Empowerment, Affordances, S-D Logic, Occupational Health.

1. Introduction

Over the last years, digitalization of healthcare has been the topic of interest from both academics and practitioners (Agarwal et al., 2010; Romanow et al., 2012; Hajli and Featherman, 2018). Digitalization refers to the socio-technical process of utilizing digital technologies (DTs) to catalyze the connectivity of individuals, organizations, industries, and society (e.g., Vial, 2019; Wang et al., 2018a). DTs have been used, *inter alia*, to access health-related information and empower patients (Horrocks and Johnson, 2014; Petrakaki et al., 2018; Stacey et al., 2009; Ziebland, 2004). The benefits of DTs include, for instance, liberating personal health data and offering a more cost-effective way of developing predictive, preventive, personalized and participatory medicine (Awad and Krishnan, 2006; Almobaideen et al., 2017; Lee and Lee, 2018; Wang et al., 2018b). DTs have therefore made the lives of patients and healthcare providers easier, safer, longer, and efficient (Angst et al. 2010; Tian and Xu, 2015).

Nevertheless, there are also challenges associated with using DTs to digitalize healthcare, including, for instance, incomplete patient records leading to complications and higher mortality (Kohli and Swee-Lin Tan, 2016), privacy concerns about personal health information (Anderson and Agarwal, 2011), immaturity of the technology being used, organizational readiness, and incompatible stakeholder views about the technology used (Aanestad and Jensen, 2016). Hence, recognising the benefits and dis-benefits of using DTs to digitalize healthcare, "both intended and unintended, deepens our field's theorization of ICT" (Majchrzak et al., 2016, p. 273).

In this paper we are concerned with the value of digitalization to key stakeholders (Aanestad and Jensen, 2016; Calvillo et al., 2015; Fisher and Owen, 2008; Mantzana et al., 2007; O'Cathain et al.,

2005; Petrakaki et al., 2018) through empowering their abilities. Empowerment can be defined as 'a process through which people gain greater control over decisions and actions affecting their health' (World Health Organisation in Arneson and Ekberg, 2005: 351). Recent literature (Russo et al., 2019) focuses on patient empowerment, defined as "the patient's health education, responsibility and active participation in managing healthcare". Empowerment means transformation of patients from passive receivers of instructions and treatment to subjects who can gather and analyse information related to their condition and can manage their own health state (ibid). Those patients are therefore co-creating value as they share information, competencies and resources with healthcare providers and business owners (Nordgren, 2008; Vargo et al. 2008; McColl-Kennedy et al., 2012; Hardyman et al., 2015; Osborne et al., 2016; Osei-Frimpong et al., 2018). Value through DT-enabled empowerment means being able to use DTs to self-manage, self-care and control their health status; in the long term it means reduction in healthcare provision costs with better management of resources, as well as improved service quality and patient satisfaction (Aujoulat et al., 2008; Russo et al., 2019). Value, hence, for healthcare (and our research) does not only mean business value but also societal value that leads to sustainable healthcare and societal development (Pappas et al., 2018; Michalef et al., 2019).

Literature so far has focused on the benefits of healthcare value co-creation through digitalization from the patients and providers' perspective. It has viewed patients and providers *in isolation* focusing on the benefits accruing to both. Pappas et al. (2018) argue that for digitalization and the subsequent benefits of value (including healthcare value as defined above) and sustainable *societal* value co-creation to take place, stakeholders should not be seen in isolation but in terms of their interactions that are, in this case, mediated by digitalization. Guided by the endorsement of Pappas et al. (2018), our research discusses the role of healthcare digitalization in empowering stakeholders (employees and employers) and affecting their interactions as they co-create healthcare value. Our research question is as follows: How does digitalization empower stakeholders and enable healthcare value co-creation?

To answer this question, we draw on the affordances (Gibson, 1986; Hutchby, 2001; Leonardi, 2008; 2012; Leonardi and Barley 2010) and S-D Logic (Vargo & Lusch, 2004, 2008) concepts to investigate how DTs afford stakeholders with empowerment -manifested as different possibilities for action- as they interact and co-create healthcare value in a service system (healthcare). Our study is based on collecting and analysing qualitative interview data from stakeholders that used the Occupational Health Adviceline (OHA) (the name of the service has been anonymised): an initiative introduced in England to provide support and advice to SMEs and improve their employees' management of health and well-being. OH, being a service system that is a complex configuration of people, organizations, and technology but dominated by human behaviour and needs is appropriate for service research (Breidbach et al., 2016; Maglio et al., 2015) and extends beyond dyadic relationships (e.g. customer-provider) which have been dominating service research. In this research that focuses on the OH context by stakeholders we denote the SME employers and employees as well as providers (contact centre advisors and OH nurses). We therefore extend the notion of patient/provider (Hardyman et al., 2015) in the wider healthcare

context to the employees[1]/employers and providers. Our contribution lies in explaining how digitalization organizes 'life' (Flyverbom et al., 2016). We discuss how digitalization (i) may empower stakeholders as they co-create value (McColl-Kennedy et al., 2012; Osei-Frimpong et al., 2018; Lee, 2019; Russo et al., 2019) and (ii) provides new forms of 'visibility management' (Flyverbom et al., 2016).

2. Healthcare digitalization, stakeholder empowerment, and the creation of value

In this section we briefly review the literature on digitalization, stakeholder empowerment, and the creation of value. The main points of this review as well as the main research gaps identified are summarised in Table 1.

Table 1 around here

2.1 On healthcare digitalisation

Digitalization refers to the use of DTs to change already existing processes and enable the connectivity at the individual, organizational, and societal level (Li et al., 2016; Vial, 2019; Wang et al., 2018a; Verhoef et al., 2020). Scholars have reported benefits stemming from digitalization at the operational level -e.g. efficiency because of email and intranet introduction, enhancement of collaboration across firms through the creation of multiple communication channels (Ramaswamy & Ozcan, 2016), new distribution channels and transformation of supply chains (Leviäkangas, 2016; Holmstrom et al., 2019) as well as efficiency and speed in product design (Friesike et al., 2019; Hedenstierna et al., 2019), and enhancement of user experiences (Pagani and Pardo, 2017). Recent studies have also reported benefits at the strategic level, such as enabling and supporting learning, and decision making (Baptista et al., 2020; Morton et al., 2020) and entrepreneurial activities (Nambisan, 2017; Nambisan et al., 2018; 2019).

In healthcare, digitalization literature has focused on the role of technology-enabled capabilities (Caro et al., 2018; Hajli and Featherman, 2018; Kallinikos and Tempini, 2014; Tempini, 2015; Topol, 2012) from two points of view: firstly, the provision of existing services through technology (Agarwal et al., 2010), and secondly, the empowerment of patients as a framework for understanding shifting patient roles (e.g., Schaper and Pervan, 2007; Atwal et al., 2013). In both viewpoints, adoption of technology as conceptualised in technology adoption models (e.g. Davis, 1989, Venkatesh et al. 2003) and diffusion of innovation (Rogers, 1995) has been the dominant paradigm. For instance, Schaper and Pervan (2007) have investigated the application of the UTAUT model by occupational therapists and proposed a model that extrapolates adoption as technology utilisation and the factors influencing the acceptance of ICT. In a later study, Atwal et al. (2013) have investigated the use of a particular technology, that is, 3D interior design software –allows users to simulate their homes and enables changes before these changes are implemented– to understand the perceptions of occupational theorists with regards to the clinical utility of the

[1] This is because in our OH context, we are discussing health at work and therefore an employee that seeks for help through the system can be a patient (that is, has been hospitalised) or not. It is about the "health and wellbeing of employees" (Yassaee and Mettler, 2019)

technology. Ker et al. (2018) have investigated the adoption of health information systems and argued that they can have benefits related to minimising the chaos and disorder but also contributed to the reduction of time and cost in relation to patient flow. Apart from adoption, reasons behind the abandonment of DTs have been suggested, mainly attributed to the lack of fit between users and the technology (Martin et al., 2011) or privacy issues (Agarwal et al., 2011).

Apart from technology adoption and abandonment models, a third stream of healthcare digitalisation literature has focused on how digitalization empowers stakeholders to create value and improve service outcomes (Gill et al., 2011; McColl-Kennedy et al., 2012; Osei-Frimpong et al., 2018). We examine empowerment through digitalization in the next section.

2.2 Healthcare digitalisation and stakeholder empowerment

Different definitions of empowerment have been provided in the healthcare literature (e.g. Arneson and Ekberg, 2005; Calvillo et al., 2015; Fisher and Owen, 2008; O'Cathain et al., 2005; Russo et al., 2019), with limited or no consensus on the concept of empowerment. For instance, Aujoulat et al. (2008) argue that empowerment "is a process of behaviour change, with a focus on how to help patients become more knowledgeable and take control over their bodies, disease and treatment" (p. 1229). Empowerment in the healthcare literature, hence, is about patients rejecting a passive stance and assuming responsibility for their care, as they become more knowledgeable and committed to their treatment regimes (Aujoulat et al., 2008).

Scholars have discussed the benefits and drawbacks of patient empowerment for patients and providers. For patients, empowerment can bring benefits associated with self-care and better care control on behalf of the patient and efficient care provision. The notion of self-management aims to promote health, to empower choice and to build up on capacities of individuals to better control the environment around them (Horrocks and Johnson, 2014). But when negative, empowerment can be transformed into control by the health professional (provider), since some patients would either feel the burden of undesirable responsibility or may be ill to meet their own needs and take decisions (Anderson, 1996). The new responsibilities can be a struggle for individuals with physical or mental impairments (Hasselbladh and Bejerot, 2007) or with vulnerable individuals who are unable to exercise self-care (Ravn et al., 2016).

In recent years scholars have discussed the relationship between empowerment and digitalisation (Calvillo et al., 2013). Stakeholders use DTs to educate themselves, seek for advice, and engage with online large communities around their health condition or service (Radin, 2006). Hence, stakeholders may be able to make better health choices (Petrakaki et al., 2018) thereby improving service outcomes (Aujoulat et al., 2008; Gill et al., 2011; McColl-Kennedy et al., 2012; Osei-Frimpong et al., 2018; Russo et al., 2019) and contributing to sustainable healthcare and societal development (Pappas et al., 2018; Michalef et al., 2019). For patients, DTs mean they can access health-related information (Czaja et al., 2003; Rutten et al., 2006; Seckin, 2010), gain confidence in the sense of health context (Hay et al., 2008; Ybarra and Suman, 2006), and a sense of control over their own health (Rains, 2007). Sociologists discuss the benefits of internet use on empowerment for patients over their health (Boyer and Lutfey, 2010; Casper and Morrison, 2010; Henwood et

al., 2003; Kivits, 2004, 2009, Timmermans and Oh, 2010). Through DTs, patients become rational and reflexive agents (Adams, 2011) and use DTs to manage their health (Lupton, 2014). Self-management is synonymous with the notion of the expert patient. This concept has emerged in the UK health policy under the umbrella of co-production and democratisation (Department of Health, 2001, Fox et al., 2005). Through the digitalization of healthcare, patients may become 'experts' and manage their health conditions (Caro et al., 2018; Hajli and Featherman, 2018).

Other studies, however, illustrate the benefits of DTs from providers' perspective. Providers use DTs to empower employees and employers and provide more efficient and safer care with less errors. In a study by Smith et al. (2008), tele-nurses had to follow a software based on algorithms to ensure a safe advice to the patients. While at first sight the software system restricted and prescribed tele-nurses' autonomy and skills, making they work repetitive and routinized, it also created opportunities for empowerment and learning. As the study shows, tele-nurses could manipulate their software by using their own previous professional knowledge and experience in clinical setting and they also acquired new clinical knowledge from it.

So far literature on the digitalization of healthcare and empowerment has merely focused on the benefits stemming from the use of DTs for patients and providers. Furthermore, scholars have focused on either the patient or the provider but not on the interaction between patients and providers, or even other stakeholders related to healthcare delivery.

In this paper we extend the concept of empowerment from patients to stakeholders that may include employees (patients or not) and employers. Empowerment for employees means self-controlling and self-managing actions and decisions related to their health (Arneson and Ekberg, 2005; Russo et al., 2019). For employers, empowerment means obtaining control over decisions and actions to manage the health of their employees at work.

Finally, scholars have not investigated the role of DTs within these user-provider interactions. The interaction between providers and other stakeholders for the creation of value is further reviewed in the next section.

2.3 Value co-creation, digitalization, and empowerment

Literature has highlighted the role of patients as important resources in value creation activities (e.g., Nordgren, 2008; Elg et al., 2012; McColl-Kennedy et al., 2012; Van Oerle et al., 2016; Osei-Frimpong et al., 2018) following two main schools of thought, namely 'Service-Dominant Logic' (S-D Logic) (e.g., Vargo & Lusch, 2004, 2008) and 'Service Science' (e.g. Maglio and Spohrer, 2008; Spohrer et al., 2008). According to S-D Logic, value is co-created from the interaction between patients and providers in healthcare: the former possesses information, whereas the latter can provide education, as well as management and analysis of the patients' information. For instance, patients, providers, professionals, technology, information are significant resources that constitute a service system and co-create value (Lusch and Vargo, 2006b; Spohrer et al., 2007; Vargo et al., 2008). Therefore, they need to be integrated (Vargo & Lusch, 2004, 2008) and linked (Maglio and Spohrer, 2008; Frow et al., 2016). Service Science has its roots on S-D Logic (Maglio and Spohrer 2008; Spohrer et al., 2008). It perceives service systems "as dynamic value co-creation

configurations of resources (people, technology, organizations, and shared information)" (Maglio and Spohrer, 2008: p. 19). These categories are important as they relate to rights (people and organization), property (technology and shared information), physical resources (people and technology), as well as socially constructed ones (organizations and shared information) (ibid). If we perceive healthcare systems as service systems, the use of DTs (for instance online health platforms and communities) can provide new sources of information as well as new interaction modes between patients, providers, and professionals, allowing the co-creation of value, i.e. better health choices and service outcomes, safer care with less errors, facilitating patient responsibility (Magio and Spohrer, 2008; Van Oerle et al., 2016; McColl-Kennedy et al., 2012; Osei-Frimpong et al., 2018; Russo et al., 2019). Patients are empowered through DTs -that is, transformed from passive receivers to skilled subjects (Elg et al., 2012; McColl-Kennedy et al., 2012) who gather and analyse information related to their health, and hence self-manage and self-care and co-create value (Nordgren, 2008; Vargo et al. 2008; McColl-Kennedy et al., 2012; Osei-Frimpong et al., 2018).

Osei-Frimpong et al. (2018) have investigated the patients' desire to seek health information prior to doctors' appointments and its impact on value co-creation. They suggested that such prior information improves service engagement and the commitment of the patients to comply with the doctors' instructions. At the same time, doctors need to accept and understand the behaviours of those ('empowered') patients. Integrating, hence, resources in terms of knowledge and skills contributes to value co-creation through the enhancement of the interaction and the expected service outcome. In a recent study, Russo et al. (2019) have investigated the impact of patient empowerment on value co-creation behaviours using an empirical study with 250 patients with chronic disease in Italy. They found that empowerment enhances value co-creation behaviour. Osei-Frimpong et al. (2018) have argued that "technology has the potential to be an experience-enriching and value-creating component" (p. 15). However, both Osei-Frimpong et al. (2018) and Russo et al. (2019) as well as other scholars have not looked at the relationships between providers and receivers of care and how DTs can influence these interactions that enable value co-creation. They have also did not investigate the mechanism through which DTs influence the interactions. We do this by using the apparatus of affordances, discussed in the next section.

2.4 Digitalization and empowerment: an affordances' perspective

In this study we draw upon the 'affordances' concept to illustrate how through empowerment employees and employers to co-create healthcare value. *Affordances* (Gibson, 1986; Hutchby, 2001) are 'the properties which afford different possibilities of action based on the contexts in which they are used' (Leonardi, 2011; 153). Hutchby (2001) suggests that affordances are not exclusively human or material properties but constituted in the relationships between people and the materiality of the artefacts with which they interact. Affordances grant different possibilities for action since people use materiality to achieve different goals (Leonardi and Barley, 2008; Markus and Silver, 2008). Affordances have been used, for instance, to study how objects provide different possibilities of action for people and animals (Gibson, 1986), in the sociology of science (Hutchby, 2001) and communications research (Evans et al., 2017).

In the Information Systems literature different definitions have been found. For instance, Markus and Silver (2008) define affordances as "the possibilities for goal-oriented action afforded to specified user groups by technical objects" (p. 622), whereas Strong et al. (2014) as "the potential for behaviors associated with achieving an immediate concrete outcome and arising from the relation between an artifact and a goal-oriented actor or actors" (p. 12). The concept of affordance has been used at different levels: the individual (Leonardi, 2013; Majchrzak and Markus, 2013), the organizational (Burton-Jones and Volkoff, 2017) and community (Tim et al., 2015; McKenna, 2019). Affordances have been used to discuss the intersection of IT systems and organization systems (Zammuto et al., 2007), in studying the relationship between human and material agencies where people work with routines and technologies which are flexible (Leonardi, 2011), in the use of various forms of digital media by managers (Leonardi, 2012), and when investigating the impact of technology on information visibility and transparency (Stohl et al., 2016). Recent studies have investigated affordances of Blockchain in organizations and how they can be actualised (Du et al., 2019), the use of DTs (virtual worlds) to raise awareness for the members of social and environmental movements (Tim et al., 2015; McKenna, 2019), the implementation of smart service systems (Effah et al., 2020), the impact of Platform-as-a-Service (a tool used by programmers) on software development (Krancher et al., 2018), the role of digital mediation of online opinion sharing (Piccoli, 2016), the adoption and use of physiolytics (i.e. wearables with particular data analytics and machine learning abilities that measure physiological parameters) (Mettler and Wolf, 2018), and most recently the realisation of value from big data and analytics (Dremel et al., 2020) and to discuss the opportunities that Internet-of-Things (IoT) provides to the servitization efforts of manufacturers (Naik et al., 2020). In this work, Naik and colleagues have drawn on the work of Volkoff and Strong (2013) and Strong et al. (2014) to distinguish between affordance perception (Volkoff and Strong, 2013) -a term that denotes the perception based on the interaction between an actor's goal and the artefact's characteristics- and affordance actualisation -that denotes the actions needed to make the perceived affordances a reality (Strong et al., 2014). Naik et al. (2020) argued that although identifying affordances by IoT is important, it is more crucial to discuss their dependencies as they are the ones to explain IoT servitization. In the healthcare context, recent studies have investigated the affordances of autonomously operating service robots in hospitals and the shared beliefs and concerns of health workers (Mettler et al., 2017), the evaluation of an electronic medical records system (Anderson and Robey, 2017), and how the interactions of users with health management information systems in a developing country led to either maintaining or abolishing dysfunctional system-related routines and practices (Bernardi et al., 2019).

In this research we use the definition of affordances by Markus and Silver (2008) as goal-oriented action possibilities that emerge when users interact with a technology. We consider affordances as a useful perspective as we (i) conceptualise the 'material' -that is, healthcare digitalization (artefact -technology)- and the 'social' (human -stakeholders) as having distinct properties but to argue that it is their mutual interlocking and interaction that empowers users to co-create value and DTs different possibilities for action (Cecez-Kecmanovic et al., 2014) (ii) illustrate how technology allow user empowerment and provide different possibilities of action. Our context is Occupational Health (OH), discussed next.

2.6 Occupational Health

Occupational health (OH) lies at the interplay of medicine, psychology, engineering and management (Macik-Frey et al., 2007). Studies on occupational health and safety (OHS) focus on policy and practice, individual characteristics and social relationships, injuries and accidents and management control and industrial relations (Quinlan et al., 2010). The existing literature places more emphasis on the tools, techniques, and practices rather than on definitions or concepts (Hughes and Ferrett, 2009; Lewis and Thornbory, 2010). Much of the OHS management literature is prescriptive (Smallman, 2001; Wallace and Ross, 2006) with lack of empirical studies exploring the effect of technology on OH. More specifically, Petersen (1978) describes OHs as a set of management recipes which focus on safety issues, safety performance and safety techniques. Hammer (1985) adopts an engineering approach to safety management which emphasises on specific hazards and the technical means for their control. Cox and Cox (1996) provide a sociotechnical system approach in the predominantly psychological treatment of OHS management. Ellis (2001, p. xvi) defines organisational health and safety as "action by workplaces to improve the health for workers to improve the health for workers, customers and communities" and provides a risk management approach aiming to prevent hazards and harm. Similarly, Fuller and Vassie (2004) suggest a risk management framework and suggest a best-practice approach for OHS management.

Literature has suggested that the inclusion of users is important in enhancing OH technologies' adoption and users' satisfaction (Martin et al., 2011; Atwal et al., 2013) and recently in the design of digital occupational systems (Yassaee et al., 2019). The use of DT to empower employers of SMEs in relation to OH matters is very relevant because literature on OH suggested that SMEs are less likely to have OH services compared to larger organisation, mostly because they are costly (Black, 2008; Harrison et al., 2013; Arcocena and Núñez, 2010). For the very same reasons, the scarcity of resources precludes SMEs employers to acquire a wide knowledge on OH matters, this explains why OH policies are underdeveloped among SMEs (Harrison at al., 2013; Cocker at al., 2014). A recent study, which has explored the creation of an on-line OH service, suggested that users' empowerment was part of the mission statement of the company. This is because, DTs enabled the users to acquire OH information at low cost, making the OH service more sustainable (Authors 2 et al. 2018, anonymised). Nevertheless, so far literature has investigated more the supplier side, that is, the perceptions of occupational therapists towards the adoption and delivery of OHS and not the perceptions of other stakeholders, that is, the employers and employees, apart from few exceptions (Yassaee and Mettler, 2019). In the next section we further discuss the research gaps of this study.

2.7 Research gap

The review of the literature has suggested the benefits of digitalization from a patients'/users' and providers' perspective. It was argued that digitalization offers access to online education and gives patients the opportunity to engage with online communities to be informed about their condition. In this vein, they can self-manage their care, make better health choices, and improve health service outcomes (e.g., Osei-Frimpong et al., 2018; Russo et al., 2019) while contributing to sustainable

healthcare and societal development (Pappas et al., 2018; Michalef et al., 2019). Furthermore, literature has investigated the role of patients in co-creating value (McColl-Kennedy et al., 2012; Van Oerle et al., 2016; Osei-Frimpong et al., 2018) and the benefits brought by DT-enabled empowerment (related to their transformation from passive receivers to skilled subjects). There were also studies that illustrated the empowerment from the providers perspective (Smith et al. 2008). These studies, however, discuss either the benefits of empowerment, or the unit of analysis is the patient or the provider, no matter if value co-creation refers to the *interaction* between patients and providers or other stakeholders involved in the delivery of healthcare. Even more, they do not discuss explicitly the role of DTs in influencing these interactions or they have been conducted at single points in time. Pappas et al. (2018) argue that for value co-creation to take place, stakeholders should not be investigated in isolation but in terms of their interactions; *they* lead to value co-creation. Finally, drawing on the context of this study, there are few, if any, studies, looking at how OHS can be delivered using DT and the role of the latter in empowering stakeholders. In a recent paper, Yassaee and Mettler (2019) argued that OH can make employees aware of their situation to better manage and improve it, but they do not refer explicitly to the role of DT in empowering employees or in the interaction with the other stakeholders to co-create value. Therefore, the limited holistic knowledge on OHS is also a gap that needs further consideration (Zanko and Dawson, 2012; Yassaee and Mettler, 2019).

To address these gaps, this study draws on (i) the affordances lens and (ii) the S-D Logic as we perceive providers, employers, and employees as significant in constituting the service system (OHA) and co-create value to investigate the role of healthcare digitalization in empowering stakeholders and affecting their interactions as they co-create healthcare value. We repeat, hence, our research question: How does digitalization empower stakeholders and enable healthcare value co-creation? Our theoretical framework is presented in Figure 1.

Figure 1 around here

3. Background and methodology

3.1 The background of the study

The UK Department for Work and Pensions (DWP) launched the OHA in 2009. Initially OHA was delivered through NHS Plus nurses and it was part of the NHS. In 2012 it became part of a Community of Interest Company. During its initial phase (2009-2012) the service was available to owners and managers of businesses with 0-249 employees in England and Wales. From 2012 the service was made available to all businesses and employees. The introduction of the OHA as identified by the Dame Carol Black review (2008), was because SMEs had limited or even no access to OH support. Moreover, SMEs business owners had only limited knowledge on OH and did not invest in OH services because they did not see the business case (HSE, 2016; Black, 2008; Authors 1 and 2 anonymised 2018).

The OHA (technology-enabled service system) attempted to address these issues and create value for both employees (patients) and employers (SME owners) by providing to owners early and easy access to high quality, professional advice tailored to their needs. It was anticipated that employees (patients) would also benefit from this service, as their employer would take care of their care needs. Qualified occupational health nurses were made available to take calls to provide advice to

managers of SMEs on any occupational health issues, gain feedback from the users as they were using the system and use this for improving the service. During the initial period (2009-2012), the OHA provided advice over the phone. Since 2012, the OH service delivered through the system evolved in a multi-channel service. Employees and employers would interact using the technology-enabled system to seek advice over the phone, through online chat or by downloading detailed documents provided on the OHA website. While initially the OHA was only made available to employers it was then made available to employees, who unexpectedly started using this service. Healthcare value started to be co-created by both employees and SME owners. SME owners would get informed on OH policies and procedures and would be able to improve the care provided to their employees as well as safety and process efficiency at work. Employees would obtain access to important information regarding health at work and were empowered to use this information to self-manage some work-related condition or to use this information to contact their employers so that new OHS policies could be implemented in the workplace.

Hence, value would be co-created from the interaction or SME owners, employees, and contact centre advisors and OH nurses although this element of co-creation was not anticipated by the initiators of this innovative OHS (DWP, 2012).

3.2 Data collection and analysis

Following Breidbach and Maglio (2016), we argue that technology enabled value co-creation is not fully understood; this means that qualitative case studies are appropriate as a research strategy. Furthermore, according to the tenets of SDL and value co-creation our focus is (i) on the service system (technology enabled OH Service) rather than a single organization (Breidbach and Maglio, 2016; Spohrer and Maglio, 2008) and therefore the unit of analysis was the service system (Maglio and Spohrer, 2008), (ii) investigate the socio-technical exchange processes, that is the relationships between the stakeholders (Figure 1) as facilitated by technology rather than sole technology (Breidbach et al., 2013a; 2013b; Breidbach and Maglio, 2016).

The study drew on semi-structured interviews with managers and employees of SMEs who have used the OH and managerial staff and nurses working for the OHA. Firstly, we interviewed the managers of the OHA (4 interviews), OH nurses, contact centre managers and contact centre advisors (12 interviews). These data allowed us to better understand the service. Subsequently, we sent an on-line survey to 1,295 employers who had used the OHA and received responses from 218 employers. From these responses we have interviewed 15 employers and 3 employees who were back at work after a period of sickness absence, and whose managers utilised this service. Afterwards, another survey was sent to the 550 employees who had utilised this service with 103 responses. From this second survey we conducted 8 semi-structured interviews with these employees. The criteria we used to identify interviewees were the participants' willingness to be contacted, participants' industry, their motivation for using the OHA, and the type of adjustments implemented. Informants were encouraged to adopt a free format and describe their experiences from using the service. Questions included, for instance, how and why the service was used, how they felt from its use. The interviews lasted for 45 minutes on average, were audio recorded and transcribed *ad verbatim.*

The study followed the principles of inductive theory building (Eisenhardt, 1989; Strauss and Corbin, 1998) and iterative approach to coding and analysis (Miles and Huberman, 1994). Systematic coding did not take place until data collection ended, although both were intertwined when identifying the initial themes. We followed the guidelines of the value co-creation study by Breidbach and Maglio (2016) who analyzed the roles of stakeholders (who?), resources they use (what?), and their practices (how?). (Table 2).

Table 2 around here

Furthermore, we identified the different uses of the technology by the participants, and the material properties of the technology. Attention was paid to those features which allowed participants to use technology in different ways. The researcher moved back and forth from theory to data (Yanow and Schwarz-Shea, 2006). To analyse the role of technology, we followed the broad guidelines by Leonardi (2017): firstly, an accounting of the materials out of which the technology was fashioned took place; secondly, an accounting of how people perceive the materials and begin to use them occurred; and thirdly, an accounting of how technology affected the organizing process (OHS) was conducted. This process is extrapolated in Table 3.

Table 3 around here

4. Findings

4.1 Empowerment through digitalization: contact centre advisors, OH nurses, and 'Knowledge Base'

Contact Centre Advisors and OH Nurses co-created value with SME employers and employees by directing them to specific services or offering OH advice. In this vein value for them was the provision of more efficient and safer care through the system with less errors.

Specifically, the system allowed the Contact Centre Advisors to act as gatekeepers, directing users to specific OH related services, so that the time of OH nurses can be used more efficiently. The Contact Centre Advisor (1) clearly states this point:

"We as a Contact Centre have to be able to field a lot of the, non-specific queries, I think originally everything would have gone to the nurses, they're spending an awful lot of their time giving basic general information to people, so I think the strength is that the nurses are able to do what they're qualified to do and deliver the information that they're specialised in, whereas we can deliver the easy, the general, the public type information that people need. So I think that's the strength there that we can field a lot of the simple easy queries. (Contact Centre Manager)"

Moreover, the same Contact Centre Advisor (1) argued:

"I normally direct users to ACAS union, etcetera. That would be my most frequent sort of requests. Other types of queries are quite varied, such as I need particular vaccinations for a job …" (Contact Centre Advisor 1)

The OH Nurse Advisors co-created value through a more in-depth consultation and advice related to OH issues. As the OH Nurse 1 clearly pointed out, their mission and duty was to support employees and employers through the system with relevant information (visibility) so that they can be more knowledgeable can act to solve their related OH issues autonomously:

"The purpose of the service is to advise employers, really it's about advising employers but employees as well about sort of some steps that they can take in order to manage members of staff who have an occupational health issue, it's not solving, always solving the occupational health problem, we can direct them of how to solve it, but not solving it." (Nurse Advisor 1)

The introduction of the 'Knowledge Base', represented a further step to better help the users to acquire OH knowledge and take actions autonomously. The empowerment of the users via DTs enabled the service to cut costs. As one of the funders of the OHA pointed out:

'Yes, we wanted to empower the managers… through the new Knowledge Base we wanted to help them to find the information they need by themselves. They can still contact the OH Nurses, but they don't have to… so the service will be cheaper for us' (Funder 1)

Overall, both Contact Centre Advisors, OH Nurses and the 'Knowledge Base' facilitated the process of OH value co-creation and helped employees and employers through the OH system (resources and practices -see Table 2) to solve OH related issues or to implement OH policies.

4.2 Empowerment through digitalization: the employers

For employers, digitalization enables co-creation of value by affording them the possibilities for 'seeing', 'knowing', and 'governing', related to 'visibility management' (Flyverbom et al., 2016).

The OHA has been introduced to help employers of SMEs manage the health of their employees by taking immediate and appropriate actions. Initially, employers utilised the service in a reactive way: they experienced a problem, for instance when an employee was off sick and, as first reaction, they called the OHA to seek for some help ('seeing' and 'knowing' –understanding the situation). As our data suggested, some of these employers after using the OHA to solve a specific problem, started utilising other available resources such as the chat-line 'ask a question' and the OH on-line resources, to improve and prevent poor health at work ('governing' the situation). The on-line database of the OHA empowered these users, who started implementing health training and other initiatives independently, without the support over the phone of OH nurses.

For instance, employer 11 initially contacted the OHA to ask some information on how to deal with an employee who contracted shingles, then, after following the recommendation of the OH nurse, she explored further the on-line resources offered by the OHA and decoded to implement some health-related training in the company (from 'seeing' and 'knowing' to 'governing'). She was, therefore, able to know what the process was ('transparency') as the system had 'disclosed' the information regarding to the illness and then was able to manage ('govern') it.

"…initially it was very much on a reactive basis so to improve, you know, certain situations of what was happening at that time ['seeing' and 'knowing'] *but now I also see that it can also be used to hopefully develop our wellness, programmes and hopefully act as a prevention as well* [governing]*" (Employer 11)*

Similarly, Employer 5, director of a small advertising agency, contact the OHA because an employee was often off sick and, although at the end the employee decided to leave the company,

the Nurse Advisor helped her to follow up the right guidelines which could have helped the employee to solve his problems:

"Well we did end up going through disciplinarians, sorry prior to that we sat down and talked to him and we went through a three month training programme to try and cover off everything that we thought might be causing problems after having a conversation with him and then things just never got better and in the end we had to start implementing a disciplinary …..things didn't get better and we had a chat to him and he agreed that he wasn't enjoying the job, it wasn't the type of job that he thought." (Employer 5)

It was common for employers to use the OHA to formalise or introduce specific policies. In many cases these policies were not present. Employers held very limited knowledge related to OH issues, mainly because they could not afford the cost of an OH specialist. Employer 6-chief executive of a non-profit training organisation stressed this point:

"*What I found is that it was very difficult to get any assistance with any health issues with the staff and I didn't have enough knowledge. I had a member of staff that was on long-term sick and he was very seriously ill and he wanted to come back to work and return to work, so after an eighteen month absence he wanted to come back. But I didn't know what steps I needed to take to get him back to health and make sure coming back to work didn't make his health worse, that there was no detrimental effect on it. And I just couldn't find any information anywhere about occupational health assessments and being very small we only have twelve members of staff so it's not a service I can buy in regularly because I probably, it's the first time I've used it in thirty years of operation." (Employer 5)*

The OH Nurses enabled employers to take appropriate actions and implement OH policies by offering specialist knowledge and specific referrals:

'she explained to me what an occupational health assessment was, how I could access it, and what it would do for the member of staff that wanted to return to work. So, without that advice I wouldn't even know where to have gone… What we did was we had a much more structured plan if someone needed to return to work after a long term off, so we came up with a new procedure of how we would put that plan together and to use occupational health assessment if we needed it in the future. (Employer 6)

Employer 6 pointed out that, apart from solving a specific situation related to a single employee, the use of the OHA and the consultation with the OH Nurse enable her to add the OH assessment in the staff Handbook.

"*Although he has left now through ill health, he did actually return to work. So, the impact was immediate in that we had a member of staff back at work…. Before we didn't have a policy for return-to-work plan and now we have." (Employer 6)*

Interestingly, visibility and transparency were not the only affordances of the technology-enabled OHA. As our data revealed, at times employers felt that interventions of OH professionals limited their own decision-making. Visibility and in particular 'disclosure' of information on particular diseases as well as on sickness leave provided by employers (involuntary disclosure of information) led to employers being enforced to follow the professional advice of OH advisors who in some occasions suggested employers to provide a longer period of sickness leave to fully recover or, to

work part-time for a certain period. While some employers accepted these OH recommendations, others felt that this service limited their own management power:

"… we felt a bit ambivalent about this service because he (OH professional) seemed to be very much siding with the individual and saying that the company should do way beyond what was practical in order to help her. And for a small company, we only employ thirty-five people, it's difficult when such a key member of the team is really given the authority to just go whenever they want, whenever they don't feel well, just go [involuntary disclosure of information –leave allowed]*." (Employer 12)*

Therefore, the employers (owners) could pick and choose from the available information, deal with OH related problems independently and co-create a safer working environment for staff and their enterprises. Hence, the resources and practices (see Table 2) of employers as facilitated through the technology-enabled OH System empowered them and contributed to co-creating value with the stakeholders.

4.3 Empowerment through digitalization: the employees

The OHA was initially created to support and provide value for employers/managers of SMEs. Once digitalization allowed for access to employees, the popularity of the system increased rapidly. They felt at ease in contacting the OH nurses over the phone. Digitalization (the OHA, that is) had brought unintended possibilities for action and enables co-creation of healthcare value as follows. Employees were empowered to self-manage their care through obtaining information on their problem to understand ('seeing' and 'knowing') and seek on-line solutions to their issues anonymously –they were able, therefore, to self- 'govern' and manage their condition. In the past, many employees did not disclose their own health conditions because they felt embarrassed or unconsciously guilty. However, the tele-nurses, the chat-line/ 'ask a question' and the on-line resources created a sense of anonymity, transparency, and safeness.

For instance, a head teacher decided to contact this service because, after a series of injuries she needed specific work adjustments which were not offered by her employer. This employee at the end, decided to opt for working part-time, so that she could do her physiotherapy treatment:

"Well they should have but in practice they don't have and I kind of feel that everything that I get I have to fight for, you know, for example I think my employer should know about the height of chairs that I should sit on, you know to make it comfortable especially as they know I've had back injuries and more recently a neck injury, you know there's lots of little things and you know I often feel that I am the one who finds out for them and tells them, you know, which shouldn't be the case." (Employee 6)

Another employee used the advice-line resources as a self-help tool to deal with stress at work. He did not mention to his manager that he contacted the OHA or that he was experiencing stress-related problems:

"I have picked up things like post-traumatic stress and also workplace stress, and there are actually, you know, there's an awful lot from reading widely that you can actually pick up that's useful to you, even from, you know, even I have to say that I've actually picked up a lot from stuff about posttraumatic stress disorder 'cos I actually

believe that workplace stress in extreme cases is actually more similar to that than is generally given credit for." (Employee 4)

Another employee decided to contact the OHA because she was bullied at work. Her employer was not very knowledgeable on how to deal with stress at work, so she turned to the OHA for advice. This employee at the end decided to quit her job, however she was pleased that her actions challenged some managerial behaviours in her workplace. Her employer became more aware and proactive on how to deal effectively with stress at work:

"… My employer didn't know how to deal with stress in the workplace, the adviceline gave me that confidence really to go in and say, you know, "You need to be doing a risk assessment of my job, my work," and to begin with they were sort of, saying, "Oh well, somebody in the organisation can do it," and I said, "Well actually it would be better if it was somebody external or somebody who actually is on the health and safety committee within the workplace, because they'll probably have a better understand or appreciation", I think they just wanted anybody to do it [laughs]…" (Employee 3)

Other employees contacted the OHA service to double-check the dispositions of their employers. They felt safe to ask information to the OH nurses, because these nurses were not part of their company and could therefore offer an independent and neutral support:

"*I used the advice line because I was struggling with my health, and this caused some problems for me at work, and the main reason that I contacted the advice line was because my employer had asked for my permission to contact my GP and requested a full report on my current state of health. And I felt under a certain amount of pressure to give this permission, but I didn't actually want to give the permission, not because I had anything to hide, but because I felt like this was private.*" *(Employee 2)*

Hence, the resources and practices (see Table 2) of employers as facilitated through the technology-enabled OH System empowered them and contributed to co-creating value with the other stakeholders.

5. Discussion

In this paper we drew upon the S-D Logic and affordances theories to argue that digitalization (technology) empowers stakeholders and allows them to co-created value (Table 4). The next sections discuss the theoretical and managerial implications of the study.

Table 4 around here

5.1 Theoretical implications

We contribute to the literature of digitalization in healthcare as we illustrate the role of digitalization (DTs) in empowering the complex interplay of stakeholders (employees, employers, and providers) (and their resources and practices) (Breidbach et al., 2013a; 2013b; Breidbach and Magio, 2016) to co-create healthcare value. Previous studies have looked at the benefits of technology-enabled empowerment for value co-creation focusing on *solely either the patient or the provider and their perspectives* (Nordgren, 2008; Vargo et al. 2008; McColl-Kennedy et al., 2012;

Breidbach and Maglio, 2016; Osei-Frimpong et al., 2018; Russo et al., 2019). Osei-Frimpong et al. (2018) have investigated, from the patients' perspective, the role of pre-encounter information in the interaction and value co-creation, Russo et al. (2019) have looked (again, from the patients' perspective) at the relationship between empowerment and value co-creation and Lee (2019) has examined the effect of the intention to participate in the value creation process. Our paper extends these studies by being *digitalization-centric*, thereby looking at the role of DTs in influencing the *interactions* between the stakeholders (employees, employers, and providers) in the OH context (following the S-D Logic and work of Vargo and Lusch (2008)) who are involved in the delivery of the OH service.

We argue that digitalization empowers stakeholders as they co-create value: for employees, DTs can reconfigure the ways in which one's self- management and control take place (Kuokkanen and Leino-Kilpi, 2000; O'Cathain et al., 2005); and for employers, DTs provided access to important OH information, helping employers deal with OH related problems and create a safe working environment. Providers (contact Centre Advisors and OH Nurses) used the OHA (DTs) to empower employees and employers by directing them to specific services or offering OH advice and specialised knowledge provision, and hence co-create more efficient and safer care with less errors. DTs brought the affordance 'visibility management' as anonymity, transparency, safeness, and disclosure of information/detachment. For providers DTs may help in gaining long-term benefits in terms of service improvement, with better management of resources as well as improved service quality and employee and employer satisfaction (Aujoulat et al., 2008; Russo et al., 2019), leading to sustainable healthcare and societal development (Pappas et al., 2018; Michalef et al., 2019). Therefore, we illustrate the role of 'visibility management' (Timmermans and Oh, 2010; Flyverbom et al., 2016) as the apparatus through which empowerment was manifested through DTs and created the necessary conditions for value co-creation that enables sustainable healthcare and societal development (Pappas et al., 2018; Michalef et al., 2019). In this vein we also contribute to the literature as we extend the study of Pappas et al (2018) by arguing that it is DTs and 'visibility management' that empowers employees and employers as they interact to co-create value. Subsequently, we extend the literature in OHS as we investigate how OHS can be delivered through technology (Zanko and Dawson, 2012). Therefore, our research contributes to the literature of digitalization in healthcare as it illustrates how digitalization organizes 'life' (Caro et al., 2018; Hajli and Featherman, 2018; Flyverbom et al., 2016; Kallinikos and Tempini, 2014) by co-creating value: it is the affordances that create experiences accumulated as stakeholders interact through DTs "that help maximize results on their own care quality" (Lee et al., 2019: p. 392). We, finally, extend the study of Hardyman et al. (2015) by reinvigorating the importance of value co-creation underpinned by DTs (digitalization) in understanding stakeholder engagement in healthcare at the micro-level.

5.2 Managerial implications

This paper reveals the importance of digitalization and DTs in the interaction between stakeholders (employees, employers, and OH nurses/ centre advisors) during the value co-creation process. There is a need for all stakeholders to understand and familiarize themselves with the new expectations as defined by value co-creation.

Since DTs are *sine qua non* in value co-creation, it is important that providers collaborate with employees and employers and gain useful feedback and encapsulate this feedback in improving these DTs to allow better interaction between all stakeholders. Understanding this feedback but also the different affordances through DTs could lead to actions (or measures) in cases where technology does not meet their expectations. Especially when it comes to healthcare providers, they should encourage both employees and employers to also interact through the service system (the OH system in our case) as they are now considered partners in the delivery of care. Furthermore, our study demonstrates the benefits of carefully designing DTs to meet stakeholder expectations while ensuring risks from unintended consequences are mitigated. Therefore, a holistic view of service delivery is needed, that considers all essential elements and areas of interaction. Such consideration will empower all participating stakeholders who interact and co-create healthcare value.

6. Conclusions and further research

In this paper, drawing on the case of OHA, we discussed how DTs influenced the interactions between employees, employers, and contact centre advisors/nurses and illustrated how DTs empower employers and employees to co-create value.

Our limitation lies in following qualitative research (Lincoln and Guba 1985) tenets. Our results cannot be generalised but could be used to inform theory. We provide a nuanced view of a phenomenon and the results need to be judged depending on the plausibility of the reasoning used when analysing the findings and drawing conclusions from our data.

Notwithstanding this limitation, we could develop and further extend our arguments in the future. Future studies could investigate larger organisations provide a better understanding of the value of healthcare digitalization and how it can empower employers, employees, and providers. Furthermore, we have based our study on qualitative data. It would be, hence, appropriate to conduct large surveys –using longitudinal data across industries and sectors to further understand the DT-enabled interactions between providers, employees, and employers as they co-create value. Furthermore, this research could be expanded to a larger scope, for example, in more complicated organizational contexts, and to add an advanced quantitative analysis that expands and supports your findings and provides theoretical contributions.

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Figure 1: Theoretical framework

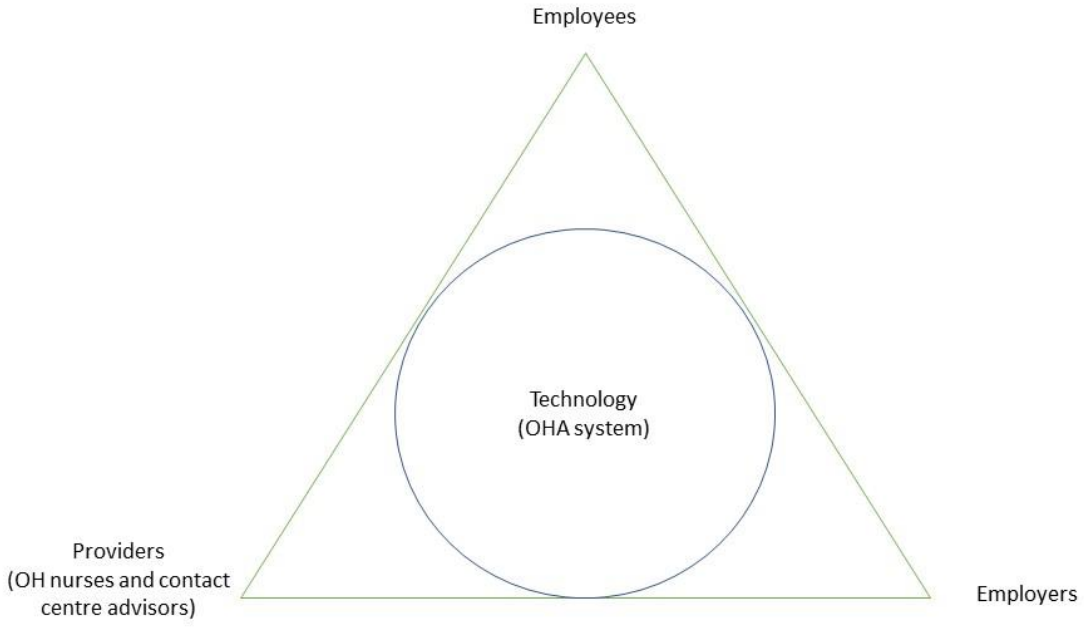

Table 1: Healthcare digitalization, stakeholder empowerment, and the creation of value

Literature strand	Focus	Research gaps	Authors
Healthcare digitalization	• Technology-enabled capabilities • Improving existing services through DTs • Patient empowerment as a framework for understanding shifting patient roles • abandonment of DTs attributed to the lack of fit between users and the technology, or privacy issues	• Benefits accruing from the interaction between patients and providers, or even other stakeholders related to healthcare delivery. • The role of DTs within patient-provider interactions.	Agarwal et al., 2010; 2011; Atwal et al., 2013; Caro et al., 2018; Hajli and Featherman, 2018; Kallinikos and Tempini, 2014; Martin et al., 2011; Schaper and Pervan, 2007; Tempini, 2015; Topol, 2012
Healthcare digitalization and stakeholder empowerment	Stakeholders use DTs to: • Educate themselves, seek for advice, and engage with online large communities around their health condition or service • Make better health choices • Improve service outcomes • gain confidence in the sense of health context and a sense of control over their own health • Contribute to sustainable healthcare and societal development • become rational and reflexive agents and use DTs to manage their health • Through the digitalization of healthcare, patients may become 'experts'		Adams, 2011; Aujoulat et al., 2008; Boyer and Lutfey, 2010; Casper and Morrison, 2010; Caro et al., 2018; Czaja et al., 2003; Gill et al., 2011; Hajli and Featherman, 2018; Hay et al., 2008; Henwood et al., 2003; Kivits, 2004, 2009; McColl-Kennedy et al., 2012; Lupton, 2014; Michalef et al., 2019; Pappas et al., 2018; Petrakaki et al., 2018; Radin, 2006; Rains, 2007; Rutten et al., 2006; Russo et al., 2019; Seckin, 2010; Smith et al. 2008; Timmermans and Oh, 2010; Ybarra and Suman, 2006

	and manage their health conditions Providers: • Empower (sometimes deskill) employees and employers • Provide more efficient and safer care with less errors.		
Value co-creation, digitalization, and empowerment	• Patients' desire to seek health information prior to doctors' appointments and its impact on value co-creation. • Prior information improves service engagement and the commitment of the patients to comply with the doctors' instructions. • Integrating resources in terms of knowledge and skills contributes to value co-creation. • Empowerment enhances value co-creation behaviour.	• Relationships between providers and receivers of care; how DTs can influence these interactions that enable value co-creation. • The mechanism(s) through which DTs influence interactions.	Osei-Frimpong et al., 2018; Russo et al., 2019.
Occupational health	• Inclusion of users to enhance OH technologies' adoption and users' satisfaction and recently in the design of digital occupational systems. • SMEs are less likely to have OH services compared to larger organisation, mostly because they are costly • Scarcity of resources precludes SMEs employers to acquire a wide knowledge on OH matters	• How OHS can be delivered using DT • The role of DT in empowering stakeholders • How DT affects stakeholder interactions as they may co-create value through the delivery of OH service.	Arcocena and Núñez, 2010; Atwal et al., 2013; Authors 2 et al. 2018, anonymised; Black, 2008; Harrison et al., 2013; Martin et al., 2011; Yassaee and Mettler, 2019; Yassaee et al., 2019

	• Empowerment of users enables the users to acquire OH information at low cost, making the OH service more sustainable		

Table 2: Stakeholders (who?), resources (what?), and practices (how?)

Stakeholders in the OH System (who?)	Resources in the OH System (what?)	Practices of exchange in the OH System (how?)
Contact centre advisors, OH nurses	-Specialised knowledge, experience, and expertise -Professional judgement -Knowledge base (methods/tools after the OH system) -Understanding of the employees' and employers' needs	-Offer public type information that people need (centre advisors) -Offer OH Advice (nurses) -Assist employers in implementing OH policies -Provide efficient and safer care through the system with less errors
Employers	-Information on the business and its goals -Information on employees -Information on OH policies (if any) -Own resources (e.g. time) to obtain advice	-Seek for help regarding employee sickness -Organise health training from information provided -Prevent poor health at work -Formalise or introduce specific OH policies at work -Being enforced to follow OH advisors' advice (limited their own management power)
Employees	-Information on their (health/non-health related) condition and the context of their lives. -Information on their employer -Own resources (e.g. time) to obtain advice	-Self-manage their care through obtaining information -Seek on-line solutions to their issues anonymously (while experiencing health issues) -Seek advice on work adjustments (following health issues) -Seek advice on non-health issues at work (e.g. bullying)

Table 3: The qualitative research process.

Steps	**Case examples**
Accounting of the materials out of which the technology is fashioned	*Initially the OHA started as a free OH support over the phone with OH nurses and was meant to be only for SME owners. After a few years two other services have been added: 'on line chat' and 'knowledge base' providing OH information. At this stage it has been decided to open the service to large companies and employees.* *We asked questions to managers and nurses about the initial creation of the service and its mission.*
How people perceive the materials (technology)	*The users could easily find the OHA on line with a simple search e.g. 'occupational health support'; 'health at work'. With a simple registration, all users could have access to a variety of OH information on line and could have a phone consultation with OH nurses.* *We asked the users why they have contacted the service and its usefulness.* *The users perceived the OHA as* *1) Safe, because the anonymity of the encounters* *2) Fast-nurses provided them immediately the relevant information and they could check themselves the information via the knowledge base,* *3) Impartial- the advice line was created for managers, however the OH Nurses did not always support managers' decisions, they offered a professional advice,* *4) Easy to use-the process of contacting the nurses and to find information was straight forward* *5) Convenient, because it was free.*
How technology affects the organizing process (OHS)	*Although the service was created for SMEs owners, many employees started using the service.* *We asked the managers and nurses why employees started using the service.* *We asked employees why they have contacted the advice line.*

	Employees started using the service because they felt they were not supported at work. For them it was easy to approach this service because it provided a confidential and impartial advice. Employees liked the fact that did need to have face to face interactions.

Table 4: Intendent and unintended possibilities for action afforded by empowerment through digitalization for stakeholders (employers, employees, and advisors/nurses)

	Value of the OHA (Employer and employee empowerment)	
	Affordances **(possibilities for action)**	**Manifestation**
Employers	Visibility management Seeing Knowing Governing	Transparency Disclosure of information
Employees	Visibility management Seeing Knowing Self- Governing (self- managing)	Anonymity Transparency Safeness Disclosure of information Detachment