The Role of Market Knowledge Type on Product Innovation Performance

DAN PETROVICI

MICHAEL OBAL

BRYN WALTON

and

ANDREW FEARNE

Abstract

While it is understood that market knowledge can positively impact product innovation performance, a better understanding on the nuanced roles of different aspects of market knowledge is needed. More specifically, we aim to gain an understanding of how different types of market knowledge, such as tacit knowledge, are developed and utilized, especially in high uncertainty environments. This research was conducted with a sample of in-depth interviews with industry experts in new product development in the UK grocery sector (N=8) followed up by a survey of 193 companies from the UK grocery sector. The study proposes two measures of market information gathering activities and market knowledge volume informed by input from experts in the UK grocery sector. Results show that market information gathering activities (MIGA) have a positive effect on market knowledge volume and specificity. Market knowledge volume and specificity consequently have a direct effect on product innovation performance. Finally, market knowledge tacitness is positively moderated by market uncertainty. That is, market knowledge tacitness is most impactful in high uncertainty environments, but offers limited benefit in low uncertainty environments. This study provides evidence of how market knowledge gathering activities and types can positively impact new product performance, especially in high uncertainty environments.

Keywords: Market knowledge, New product development, Market information gathering activities, Market knowledge tacitness, Market uncertainty, Product innovation performance

1. Introduction

Understanding how market knowledge affects the performance of new products can play a crucial role in a firm's decision making process and the relative success of the new product. Indeed, knowledge and information have become important elements driving profitability and business success (Borg, 2000). Therefore, detailed insight into the role of market knowledge in new product development (NPD) is critical to sustaining profitability and business growth, particularly in mature markets. It is vital because such mature markets are characterised by increased levels of competition, rapidly changing market environments, higher rates of technical obsolescence, and shorter product lifecycles (Griffin 1997; Cravens, 2002). The difficulties of producing successful new product are reflected throughout the extent academic literature by references to failure rates of products after launch. The Product Development and Management Association (PDMA) best practice survey suggested that 42% of newly launched were unsuccessful (Barczak, Griffin, and Kahn, 2009). Despite the importance placed on new product development (NPD) across industries, successful new product introductions remain elusive. Olin and Shani state that NPD is the single most important factor for firm success or failure in a wide variety of industries (Olin and Shani, 2003).

In response to a desire to improve upon high failure rates across industries, past studies have examined antecedents of successful new product development (Tsai and Huang, 2012). Different factors have been analyzed as antecedents of NPD performance, such as market

orientation (Langerak, Hultnik and Robben, 2004), technology synergy, product advantage and innovativeness (Langerak, Hultnik and Robben, 2004; Tsai and Huang, 2012), and cross-functional collaboration and integration (Li and Calantone, 1998; De Luca and Atuahene-Gima, 2007; Keszey, 2018). Knowledge integration mechanisms have been thought of as a mediator of cross functional collaboration on new product performance (De Luca and Atuahene-Gima, 2007). Throughout the literature, market research and market knowledge are identified as key drivers of new product success, especially in uncertain markets (Di Benedetto 1999; Joshi and Sharma, 2004; Li and Calantone, 1998). This knowledge may assist marketers and R&D managers in their decisions and offer insights into the market potential for the new product.

De Luca and Atuahene-Gima (2007) offered an insight into this by developing assertions that market knowledge has different intrinsic properties and that these properties impact success in different ways. This study further develops this approach by placing market knowledge in the context of the Resource Based View (RBV) of the firm. As a resource, investment in generating different types of market knowledge can be targeted and market knowledge resources should be deployed according to specific contexts in order to create a sustainable competitive advantage. With that said, simply gathering market knowledge without a thorough understanding of how that knowledge can impact new product development and performance may prove wasteful. Thus, we not only analyze the impact of market knowledge gathering activities (MIGA), but also various dimensions of market knowledge based on prior literature: market knowledge volume, specificity, and tacitness (De Luca and Atuahene-Gima, 2007; Aarikka-Stenroos and Sandberg, 2012). Furthermore, we analyze the usefulness of these dimensions of market knowledge in both low and high uncertainty environments. More specifically, we aim to gain an understanding of how different aspects of market knowledge, such as knowledge tacitness, are developed and utilized, especially in high uncertainty

environments. The findings from this study support the RBV by testing the idea that tacit knowledge is significant to performance, since tacit knowledge would be harder to imitate than other knowledge types. In summation, this study pursues the following objectives: i) to explore how market information gathering activities can be used to develop different market knowledge dimensions; ii) to evaluate the role of market knowledge dimensions (e.g. volume, specificity, and tacitness) on product innovation performance (PIP); and iii) to investigate how market uncertainty (i.e. low uncertainty vs. high uncertainty) may impact the influence of these market knowledge dimensions onto product innovation performance. This paper makes several contributions to the extant literature by shedding light on the role of market knowledge dimensions in new product innovation performance.

2. Resource Based View and Product Innovation Performance

The RBV suggests that firms have various resources available to them - 'resource heterogeneity' (Aarikka-Stenroos and Sandberg, 2012) - and that this resource heterogenity can persist over time (Wernerfelt, 1984). In the RBV, competition within an industry becomes reliant on the deployment of internal resources. The RBV proposes that organizational resources and key capabilities, through their characteristics of tacitness, complexity and specificity, contribute to firm performance (Aarikka-Stenroos and Sandberg, 2012). Core capabilities are embeded in the tacit cultural, social, and intellectual advantages of the firm providing a protective role against imitation and replication (Lubit, 2001). Thus, tacic knowledge is viewed as an extremely valuable resource under the RBV framework as this type of knowledge cannot be easily replicated or imitated.

RBV emphasises the importance of knowledge creation alongside other resources in order to create and sustain the competitive advantages for the firm (Barney, 1991; Reed and Di Fillippi, 1990). Kogut and Zander (1992) initiated the knowledge-based-view of organizations.

New product creativity is a function of a firm capability to create, manage, and maintain knowledge (Grant, 1996; Zhou and Li, 2012). In particular, tacit knowledge plays a crucial role in knowledge creation theory and in building such competitive advantages (Winter, 1987). Such knowledge covers unarticulated knowledge linked to senses, physical experiences, intuition, and rules of thumb (Nonaka and Von Krough, 2009). Rooted into actions, procedures, routines and emotions, ideals and values (Nonaka and Toyama, 2003) this knowledge is accumulated through learning by doing, experimentation, and perception (Mascitelli, 2000).

While the RBV is well established within the literature, a deeper dive into the use of knowledge-as-a-resource is needed, specifically delineating between the varying types of knowledge (Boxall, 2008). For example, tacit knowledge has received little empirical investigation. Further research on the role of tacit knowledge in new product development is needed (Goffin and Koners, 2011). Thus, we consider the role of market knowledge tacitiness alongside market knowledge volume and specificity as they impact product innovation performance, as outlined by De Luca and Atuahene-Gima (2007), with a specific focus on knowledge tacitness as a valuable resource.

3. Research Model and Hypotheses

The proposed model of antecedents of product innovation performance is based on the resource based view (RBV) of the firm and the theoretical conceptualization of dimensions of market knowledge (De Luca and Atuahene-Gima, 2007). The importance of market knowledge for the purpose of NPD is reflected in the extant literature where market knowledge and an organization's ability to use market knowledge are widely established as an antecedent of success (Calantone, Schmidt, and Song, 1996; Cooper and Kleinschmidt, 1987; Di Benedetto, 1999). Market research gauging the importance of consumer willingness to purchase new products and the role of concept testing is essential for NPD performance. Market testing was

regarded one of the most important factors of successful NPD (Kahn et al., 2002). Furthermore, distinct constructs, such as market knowledge dimensions (De Luca and Atuahene-Gima, 2007), market knowledge competence (Li and Calantone, 1998), market research (Hill, 1988) and market orientation (Langerak, Hultink, and Robben, 2004) that relate to the acquisition, absorption and implementation of market knowledge in the NPD process are thought to be successful predictors of new product development.

De Luca and Atuahene-Gima (2007) made a significant contribution to our understanding of the role that market knowledge plays in the development of successful NPD by empirically testing the impact of market knowledge dimensions, such as volume, tacitness, and specificity, as suggested by Galunic and Rodan (1998). Having developed a model that was tested on the Chinese high-tech industry, De Luca and Atuahene-Gima (2007) concluded that market knowledge breadth, market knowledge depth, and market knowledge specificity have positive and significant direct effects on product innovation performance, whereas the effect of market knowledge tacitness is not significant. Additionally, market knowledge depth and specificity were shown to require appropriate integration mechanisms to fully realize their potential. Prior findings highlight that different dimensions of market knowledge impact success in different ways, suggesting that different types of market knowledge may have different intrinsic properties. First, market knowledge has value in the context in which it is created and is therefore time sensitive if it is to be applied to successful new products (Galunic and Rodin, 1998). Second, the specificity of market knowledge reflects the use of procedures in the collection and use of market information towards developing new products (De Luca and Atuahene-Gima, 1997).

This study covers the gap in the RBV literature by developing a model to empirically test the role of market knowledge as an antecedent of new product success by integrating market knowledge in the RBV framework and testing the role of market knowledge dimensions

under different market conditions of uncertainty. Two measures of market information gathering activities and market knowledge volume informed by input from experts in the UK grocery sector are also proposed. The model is motivated in the sections below.

3.1. Product innovation performance

The growth of academic literature on NPD over recent years has generated a significant area of debate and conjecture concerned with the definition of a "new" product in the literature. There is an overarching agreement amongst academics that NPD performance measures should be qualified against the stated objectives of a firm in order to offer a scale of success. However, because of the wide range of objectives associated with NPD (profits, return on investment, brand awareness, customer satisfaction, etc.) we find that major studies approach success in a number of different ways. For example, Li and Calantone (1998) choose to look at pre-tax profit and return on investment as well as market share and profitability measured against stated objectives. Similarly, Di Benedetto (1999) uses the criteria of overall profitability as measured against company expectations as well as profits, sales and market share in comparison to competing product launches. Meanwhile, Joshi and Sharma (2004) measure performance based on profitability, market share and growth rate in comparison to competing new products. In the absence of detailed financial figures, we adopt a measure that asks respondents to consider their performance compared to objectives. For the purposes of this study, a new product is defined as anything that has been subjected to discontinuity in either its technical or marketing processes. This is based on the observations of Garcia and Calantone (2002) who discuss how relative innovation levels associated with NPD can be measured by "the potential discontinuity a product (process or service) can generate in the marketing and/or technological process" (Garcia and Calantone, 2002).

Describing our unit of analysis as anything that causes a discontinuity in either the technical or marketing processes of a firm allows us to take a broad, holistic approach to NPD. Because the extant literature discusses product innovativeness itself as a predictor of success (Garcia and Calantone, 2002), this study aims to model a route to new product development that allows for innovation levels to be used as a control variable. This approach is frequently encountered throughout the extant literature where constructs such as innovation levels, degree of radicalness and new product advantage are commonly used as moderators (De Luca and Atuahene-Gima, 2007; Li and Calantone, 1998). This approach to NPD research is necessary to ensure that any observations and conclusions about relationships within the NPD process are appropriate.

The performance construct used in this research develops the scales used by De Luca and Atuahene-Gima (2007) that measured market share, sales, return on assets, return on investment and profitability. These are all relative to stated objectives and the scales used by Langerak, Hultink, and Robben (2004) that approach success from a wider viewpoint looking at market level measures, financial measures and timing measures via seven indicators. In the absence of objective measures of performance, subjective measures were considered appropriate, given their correlation with objective measures (Dess and Robinson, 1984) and their use in past research on performance (Langerak, Hultink, and Robben, 2004).

3.2. Market information gathering activities

The construct market information gathering activities (MIGA) was proposed in the literature by DiBenedetto (1999). This measure is concerned with market research tools and activities that are used throughout the NPD process and in the analysis of launch. De Luca and Atuahene-Gima (2007) used the market information gathering activities construct in a similar study based on firms in China. The growth in information technologies regarding collecting

and analyzing information over the last two decades raised new challenges regarding managing knowledge (Lancioni and Chandran, 2009). The growing availability of retail audits and loyalty card data (e.g. dunhumby in UK) enhanced the range of information on consumer behaviour. Amara and Landry (2005) point out that firms that introduced successful innovations use a larger variety of sources of information (market and research sources) in addition to generally available information.

Feedback from qualitative interviews conducted in this study with industry NPD experts (see methods section) pointed out the importance of increasingly diversified sources of market research data in gathering information on the market. These include quantitative (e.g. retail audits, loyalty card data) and qualitative market research (e.g. focus groups, observational studies). Experts cited eight sources of market information that can shed light on various facets of new product development. Market information gathering activities captured the extent to which these sources are critically important for the activities related to NPD.

We argue that measuring MIGA through these sources is relevant as since Di Benedetto's conceptualisation of MIGA market research techniques have been diversified. These sources of market information implicitly capture many activities observed by Di Benedetto (1999) test marketing, studying feedback from customers. The focus of our conceptualisation of MIGA is the importance of different sources of market information for the purpose of NPD.

3.3. Dimensions of market knowledge

This study proposes a new concept of market knowledge volume that replaces breadth and depth from De Luca and Atuahene-Gima's study. There are similarities between breadth and depth. Both are referring to the amount of knowledge that firms possess and semantic meanings separate them. In the interests of achieving a parsimonious model and reducing

repetition and redundancy amongst variables, this concept of market knowledge volume is measured.

Market knowledge breadth had an AVE coefficient below 0.5 in De Luca and Atuahene-Gima's 2007 study suggesting a suboptimal convergent validity and scope for improvements in this scale. As discussed above, similarities exist between market knowledge breadth and market knowledge depth whereby the development of a more accurate, reliable scale for market knowledge breadth may not well discriminate from market knowledge depth. The need for scale development and the similarity between the constructs calls for the development of a single scale which measures the amount of market knowledge rather than the breadth or depth of a firm's knowledge. Feedback from qualitative interviews indicated potential problems of ambiguity in interpreting items related to market knowledge breadth and depth. Interviews experts or consultants in NPD were in unanimous agreement that these measures would not be well understood by all respondents. Pilot testing also pointed out that respondents could not distinguish between attributes such as "limited" and "narrow" or between "basic" and "shallow" concerned with market knowledge breadth and depth. This lack of differentiation restricts the validity of concepts such as market knowledge breadth and depth. At the same time, the proposed measures of volume uses the anchors "very weak; very comprehensive" that were found clear and less ambiguous in the pilot test.

According to Zhou and Li (2012), the extant literature suggests there are merits and demits associated with how knowledge breadth and depth influence innovation. They cite Chesbrough, (2003) and Taylor and Greve (2006) to indicate their usefulness in fostering the gathering of cutting-edge ideas. The study also refers to assertion of Tripsas and Gavetti (2000) regarding creating cognitive inertia as a result of exploiting deep knowledge in a specialised sector. Based on this rationale Zhou and Li (2012) proposed combining the effect of a firm's

existing knowledge base (breadth and depth) to examine how knowledge interacts with external market knowledge acquisition and internal knowledge sharing to influence innovation.

Based on these considerations, the concept of market knowledge volume is measured instead of breadth and depth. Volume evaluates the scale of a firm's total market knowledge and reflects knowledge of a firm's customer needs and behaviour, competitors as well as market forces, modifying De Luca and Atuahene-Gima's (2007) definition. The proposed concept of volume captures additional facets to competitors' strategies and customers. Namely, this study differentiates from De-Luca and Atuahene-Gima (2007) by disentangling the concept of knowledge of customers by considering knowledge of needs, preferences and consumer behaviour. Furthermore our concept of volume also includes knowledge of the market environment. Evidence form qualitative interviews conducted with industry experts (Table 1, Section 4.3) points out that understanding three categories of forces are important in successful product launches. These forces are economic trends, social trends and technological advancements. Hence firm's knowledge of these trends/environmental forces are captured in the concept of volume of market knowledge.

To summarize, facets of knowledge of competitors strategies and customers from De-Luca and Atuahene-Gima (2007) are retained. We consolidate this with new facets such as knowledge of three categories of environmental forces and break down knowledge of customers into knowledge of customer needs, consumer preferences and consumer behaviour. Hence this measure encapsulates a broader view of market knowledge breadth and depth as captures the understanding of both retail customers and consumers. By measuring market knowledge volume rather than depth and breadth a more parsimonious model is achieved.

Market knowledge tacitness addresses the degree to which a firm's market knowledge can be formally documented, communicated, and learned without personal experience of using it. As an implicit form of knowledge, tacitness can be hardly communicated (Nonaka, 1994).

This reflects the fact that tacit knowledge is embedded within individuals throughout the firm and therefore gives a perspective on how important is the assumed experience in developing successful new products. Relatedly, market uncertainty may have an impact on the ability to gather and use market knowledge. Market uncertainty is included to "reflect the speed of change in customer needs and preferences and in competitor actions" (De Luca and Gima, 2007; Jaworski and Kohli, 1993). Finally, market knowledge specificity reflects the extent to which market knowledge is specific to the firm's environment, as opposed to offering value in a wide variety of contexts (Galunic and Rodan, 1998).

3.4. The role of market information gathering activities

The suggestion that different types of market knowledge may have different intrinsic properties is a key component of the proposed model. Different intrinsic properties of market knowledge impact on the success of new products, and, in turn, the different intrinsic properties of market knowledge are produced in different ways. Therefore the ability to develop specific intrinsic properties of information and knowledge becomes potentially a controllable resource within a firm. This can be explained empirically by testing the direct effect on performance of theorised, latent constructs representing the different intrinsic dimensions of market knowledge in a number of organisational and environmental (market) conditions. Market knowledge dimensions are considered as human capital resources that are valuable, rare, inimitable, and non-substitutable (VRIN) (Barney, 1991). This offers an opportunity to present empirical support for the resource based view of the firm (RBV). The RBV informed the inclusion of variables characterising the internal characteristics of the firm (e.g. firm size, slack) as well as external market conditions (Joshi and Sharma, 2004; Li and Calantone, 1998).

Furthermore, the development of a conceptual model that makes a link between market information gathering activities (MIGA) (Di Benedetto, 1999) and distinct market knowledge

dimensions (Galunic and Rodan, 1998; De Luca and Atuahene-Gima, 2007), provides an opportunity to test the role of market knowledge on firm performance in the context of UK grocery sector informed by the theory of RBV. Any variance in the relationship patterns observed between MIGA and market knowledge dimensions would suggest that targeted investment in specific information gathering activities will develop specific dimensions associated with market knowledge.

Extant academic literature advocates the use of market research in order to achieve NPD success (Hill, 1988) and various types of research are comprehensively used in the NPD process by companies. This is made explicit in recent Product Development and Management Association best practice studies (Griffin 1997; Barczak Griffin, and Kahn, 2009). However, throughout the literature, there is a general agreement that it is not the act of conducting market research that is the key to success, but rather that the ability to turn this information into knowledge and to deploy competencies to use this knowledge in informing marketing decision successfully (Joshi and Sharma, 2004; Li and Calantone, 1998).

Extant literature describes market knowledge as a consequence of market information (Sinkula, 1994). The competencies and internal resources of a firm and its employees are able to develop knowledge through the acquisition and accumulation of information. A firm will have more knowledge about its competitors, customers and market trends if is extensively engaged in information gathering. Such information gathering activity provides the firm with a valuable platform to take advantage of market opportunities and optimise their market actions (Wu, Ong, and Hsu, 2008), exploit market opportunities and match new products with market needs (Ketchen, Hult, and Slater, 2007). Therefore:

H1a. Market information gathering activities have a positive impact on market knowledge volume.

In this research, market knowledge tacitness is presented as embedded knowledge. This means that it is achieved through experience and is not transferable or communicable to other people and or organisations as it is difficult to articulate and codify (De Luca and Atuahene-Gina, 2007; Galunic and Rodan, 1998). The link between market information gathering activities and market knowledge dimensions is determined by internal competencies and resources (Li and Calantone, 1998). The ability of a firm to possess and utilize unique, tacit knowledge increases as they gather information from various sources and combine that information with their existing internal knowledge (Rundquist, 2012). A firm's ability to develop knowledge out of information is directly related to their ability to fund this activity and the ability of a firm's R&D department to assimilate market information. Thus, we hypothesize:

H1b. Market information gathering activities have a positive impact on market knowledge tacitness.

The specificity of market knowledge regarding consumers, customers and competitors is linked to information in the same way as market knowledge volume (De Luca and Atuahene-Gima, 2007). Specifically, the specificity of market knowledge is improved through research and development efforts (Galunic and Rodin, 1998). As firms reach out to increased numbers of external and internal sources for information, they increase the domain-specificity of their own knowledge (Rundquist, 2012). Firms traditionally use a variety of market research sources to extract relevant information to optimise their actions (Wu, Ong, and Hsu, 2008) and reduce market risks through organisational product launches (Di Benedetto, 1999). By exerting more efforts to gather market information, firms begin to hone in on the information they are most focused on. Hence, we hypothesize:

H1c. Market information gathering activities have a positive impact on market knowledge specificity.

3.6. Market knowledge and product innovation performance

As noted by Darroch (2005), market knowledge acquisition positively impacts innovation and performance. Market knowledge volume is developed out of a combination of the constructs market knowledge breadth and depth (De Luca and Atuahene-Gima, 2007). The combined market knowledge volume constructs aim to improve the lower levels of reliability and validity reported in the original study[1] and is confirmed by factor analysis. The construct describes the amount of knowledge that a firm has about their customer, their competitors and general market trends. Market information gathered and used enhances financial success (Ottum and Moore, 1997). The capability of firms to interpret large amounts of market data in evaluating new products is critical in the success of their launches (Varela and Benito, 2005). Information gathering activities (e.g. market testing) were strongly related to success of new product launch (Di Benedetto, 1999). This study hypothesises that the greater the volume of knowledge a firm possesses, the more successful will be. Market information gathered and used may enhance financial success (Ottum and Moore, 1997). Thus:

H2a. Market knowledge volume has a positive impact on product innovation performance.

[1] In De Luca and Atuahene-Gima's 2007 study, market knowledge breadth reported AVE = .49, Composite Reliability = .79 and $\propto$ = .81. Market knowledge depth reported AVE = .50, CR = .86 and $\propto$ = .86

Tacitness was believed to have no significant impact on the performance of new products (De Luca and Atuahene-Gima, 2007). Knowledge-based intangibles (e.g. know how) determines the value of most products (Quinn, 1992) and the spiral of knowledge creation begins with a tacit understanding and continues through the manifestation of this force in the form of innovative products (Nonaka and Takeuchi, 1995). Moreover, in depth interviews with industry experts suggest that these findings may be a trait of the industry that De Luca and Atuahene-Gima (2007) examined. Further, tacit knowledge may accelerate product commercialization and provide the firm with a competitive advantage (Mazzola et al., 2012). As tacitness describes embedded knowledge that is based on employee experience, it is proposed that tacitness has a role to play in the performance of a new product. Therefore, we hypothesize:

H2b. Market knowledge tacitness has a positive impact on product innovation performance.

Market knowledge specificity describes the extent to which a firm's knowledge is specific to its particular environment (Galunic and Rodan, 1998). Furthermore, the more specific the information to a given context, the higher the value of the information (Galunic and Rodan, 1998; De Luca and Atuahene-Gima, 2007). Innovation capabilities may be sector specific (Shan, 2013), indicating that the impact of market knowledge on new product performance may depend on how closely related that knowledge is to the industry (e.g. depth of knowledge versus breadth of knowledge). As such, firms that have gathered external knowledge that complements their internal knowledge are likely to have a better understanding of their environment and can leverage that understanding to develop more successful products (Mazzola et al., 2012). More specifically, firms that are able to gather and integrate domain-specific knowledge and more likely to see positive innovation performance (Rundquist, 2012).

Therefore, we hypothesize a positive, significant relationship with market knowledge specificity NPD success.

H2c. Market knowledge specificity has a positive impact on product innovation performance.

Furthermore, the RBV literature presents firm resources as important to the development of continuous competitive advantages in different market conditions (Jiménez-Jiménez, and Sanz-Valle 2011). Environmental factors can play an important role in the relative innovativeness of a firm (Nybakk and Jenssen, 2012). Market knowledge is often seen as a resource (i.e. competitive advantage) that gives companies the opportunity to survive in uncertain market conditions (Atuahene-Gima and Wei, 2011; De Luca and Gima, 2007). Market knowledge tacitness indicates that knowledge cannot easily be communicated (Nonaka, 1994). This description of market knowledge tacitness aligns well with the resource based view that resources that cannot be easily imitated are especially beneficial for gaining a competitive advantage. Firms with tacit knowledge are likely to benefit from these uncertain markets as their knowledge is, by definition, rare, unique, unavailable to the public, and difficult to replicate (Cavusgil, Calantone, and Zhoa, 2003; Seidler-de Alwis and Hartmann, 2008). Furthermore, unique information that has been integrated into the NPD process is more likely to positively impact performance during turbulent environments (Rundquist, 2012; Thomas and Obal, 2018). Weak market knowledge can hinder the degree of integration between R&D and marketing managers, thereby benefitting those with tacit knowledge (Gupta, Raj, and Wilemon, 1985). Thus, we hypothesize:

H3. Market knowledge tacitness has a stronger impact on the product innovation performance (PIP) in conditions of market uncertainty.

4. Method

This study consists of two stages. First qualitative interviews with industry experts in NPD were carried out. In a second stage a quantitative online survey was conducted with marketing managers or product or project managers responsible for the NPD in firms from the UK grocery sector.

4.1. Qualitative interviews

In line with extant research guidelines (Churchill 1979; Hardesty and Bearden 2004), eight expert judges in NPD from the UK grocery retail industry (N= 4 consultants; N= 4 NPD managers) were interviewed in a semi-structured manner in order to improve the face validity of construct measures developed from the extant literature. Interviews lasted approximately one hour. The interview guide contained open ended questions related to respondent's definition of new products, the use of information for the launch of new products, methods used to collect, analyse and integrate market information, meetings and collaboration protocols. The consultants and NPD managers were selected for their expertise in sales and marketing, market research and NPD. The cumulative experience and knowledge of the interviewees along with precedents set in extant NPD literature justified the small number of interviews.

4.2. Survey sampling

The study followed the existing research guidelines studies by Churchill (1979) and Hardesty and Bearden (2004) to improve the face validity of construct measures developed from the literature on NPD and RBV pending the study survey. The questionnaire was distributed online and items randomised. The sampling frame consisted of a database of 2000 firms from the UK's fast moving consumer goods industry. In order to incentivise respondents,

all completed questionnaires were entered into a prize draw. Data collection took place in two stages with reliability tests and Exploratory Factor Analysis (EFA) being completed on a pilot sample (N=49) followed by a Confirmatory Factor Analysis (CFA) (Hair, Black, Babin, and Anderson, 2013) carried out on a final sample of respondents. A total of 150 firms were targeted for the initial pilot study and a 32.6% response rate was achieved.

A sample of 1850 companies distinctive from the pilot study was targeted. A final sample of respondents from 193 firms was achieved via Qualtrics. Only companies from the UK grocery sector that have been involved in new product development (NPD) over the past two years were included in the study. NPD ranged from minor innovations (changes in recipes) to more radical innovations such as new products to the firm or the sector. Respondents were asked to think about specific innovations in the past two years and included both new products to the company and new products to the industry. Firms that had no innovations in the past two years relative to the survey fieldwork have not been included in the study. Hence, prior recent knowledge of innovation-related processes and factors and recollection of indicators of product innovation performance represented critical components of construct/content validity. A focus in the sampling frame was prioritised over breadth of firms.

Marketing managers or product/project managers responsible for the NPD were used as key informants. The response rate was 10.4% relative to all companies contacted and 19.3% relative to companies that were sent written reminders. The sample consisted of 46.6% small companies (under 50), 23.3% medium (50-249), and 30.1% large companies. 28.5% of our sample had annual sales under £2.5 million, 20.7% were between £2.6 - £12 million, 15% were between £12.1 - £60 million, 7.8% were between £60 - £100 million, 9.8% were between £100 million - £200 million, and 18.1% were above £200 million.

4.3. Measures

Several researchers recommend the use of expert judges for enhancing the face validity assessment of items (Churchill, 1979; Hardesty and Bearden, 2004). Semi-structured interviews with industry experts were conducted to support the content validity of new measures: 1) Market Information Gathering Activities and 2) Market Knowledge Volume. The proposed measures for the construct Market Information Gathering Activities aims to capture the most important market research techniques in the grocery retail industry by asking how useful the techniques have been to a specific process (NPD) rather than asking how often they have been used. For Market Knowledge Volume, the interviews with industry experts showed that traditional measures of knowledge breadth and depth were not clear. However, respondents did comment that the principles were correct in that when measuring market knowledge, it is important to consider customer knowledge, competitor knowledge, the market as a whole, and more general trends (e.g. economic state of the nation). Feedback from a pilot study (n=40) confirmed that respondents find it difficult to distinguish between 'shallow' versus 'deep' or 'broad' versus 'narrow'. Hence the measure of volume was developed to replace breadth and depth.

Following Churchill (1979) and Hardesty and Bearden (2004), items were developed to specifically measure market information gathering activities in the UK grocery industry. This research completed the eight steps of Churchill's scale development procedure by specifying the constructs based on prior literature, generating and assessing the validity and reliability of existing items via expert interviews and a pilot survey (n = 49), conducting an Exploratory Factor Analysis (EFA), developing the final survey based on these results, and, again, testing the reliability and validity of the final results utilizing expert feedback and an EFA. Final items were examined based on theoretical considerations, modification indices, standardized loadings and t-values. Having reduced the items in the model through CFA, we tested for construct reliability, convergent of discriminant validity by examining the Average

Variance Extracted (AVE), Composite Reliability and Discriminant Reliability of each construct. The steps for scale purification and refinement, as outlined by MacKenzie, Podsakoff, and Podsakoff (2011), were followed for Market Information Gathering Activities (MIGA) and Market Knowledge Volume, as detailed below. Table 1 offers relevant quotes from selected expert judges which assisted with scale development.

--- Insert Table 1 here ---

Product innovation performance (PIP) was captured by incorporating the work of Langerak et al. (2004, 2007) with De Luca and Atuahene-Gima (2007). By doing this, the PIP measure captures the firm's ability to recognise and effectively cater to consumer needs and preferences. Market uncertainty was adapted from Jaworski and Kohli (1993) and De Luca and Atuahene-Gima (2007). All constructs were measured via self-reported answers to an online questionnaire with randomized items designed in Qualtrics. To test the internal consistency of our constructs, coefficient alpha's or Cronbach's alpha's were generated from a pilot study described in section 5.1. This reliability test is used extensively in the extant NPD and marketing literature (Li and Calantone, 1998; De Luca and Atuahene-Gima, 2007). Based on the pilot study, all constructs reported a satisfactory Cronbach's alpha score above .7. Non-response bias was tested using the selective extrapolation method (Armstrong, 1977). The analysis indicated no statistically significant differences in the responses of early versus late respondents. Furthermore, varying scales were used for the different constructs, thus minimizing the potential for common method bias.

The second stage of data analysis consisted of a Confirmatory Factor Analysis in Lisrel 8.8 (Jöreskog, 2006) on the full sample. Composite Reliability and Average Variance Extracted for the scales (see Table 2) were all above the generally accepted thresholds (Diamantopoulos,

2000; Fornell and Larcker, 1981) and all t-values are significant (p<0.01). This indicates good reliability and convergent validity of the measured constructs.

--- Insert Table 2 here ---

Two items were removed from the scale of MIGA (observational studies and consumer product testing) and one from PIP (on-time launch) based on the examination of cross-loadings, modification indices (values over 10) and theoretical considerations. The items retained were checked against the extant literature to ensure that they represented the original meaning of the proposed construct and provided construct validity (Anderson, 1988). The item on observational studies captures knowledge represented by the retained items. Consumer product testing and focus groups may also overlap. Loadings for the market knowledge volume capture knowledge of customer strategies, customers, consumers as well as environment (economic, social and technological trends). Knowledge of customer needs and consumer preferences and consumer behaviour were all validated. The correlations matrix and descriptive statistics of the variables are shown in table 3.

--- Insert Table 3 here ---

The differences between the chi-square of baseline and unconstrained models (which fixed at 1.0 phi matrix for each pair of dimensions) were significant (p<.01) indicating that values for the unconstrained model were significantly lower that values of the constrained model. Values of AVE were all in excess of the shared variances between each construct and the other constructs in the model. These two tests were indicative of discriminant validity of the model constructs (Anderson, 1988).

4.4. Common method bias

The common method bias has been addressed in several ways. First in terms of procedural remedies respondents were reassured about anonymity, the questionnaire was piloted to ensure items were clearly understood, have no ambiguity, (Podsakoff, MacKenzie and Podsakoff, 2012) and avoided double-barreled items or complicated syntax (Tourangeau, Rips, Rasinski, 2000). There was variation in the scale formats to reduce common scale formats bias and in the scale anchors across model constructs (Podsakoff *et al.* 2003).

To assess potential common method bias, both Harman's single factor test and common method factor technique were applied. First, Harman's single factor test assumes that a single factor will emerge that explains a significant share of variance in the model if common method variance is present (Podsakoff and Organ, 1986). Factor analysis (no rotation) revealed five factors with eigenvalues over 1.0, accounting for 79.3% of the variance. None of the five factors explained the majority of the variance with the emergent factor explaining 42.1%. Second, the common factor technique was utilised. Results indicate no path coefficients affected by the common method bias with all marginal differences (<.03) in coefficients between the unconstrained CFA model and the constrained CFA model where items loaded on the common factor in addition to the theoretical constructs. Thus, no major issues with common method bias were detected.

5. Results

Table 5 reports the standard path estimates in the conceptual model.

--- Insert Table 4 here ---

The fit indices produced by LISREL (Jöreskog, 2006) suggest an adequate fit (Hair et al. 2013). As table 5 shows, MIGA has a positive significant effect on market knowledge volume ($\beta = .49$, $p < .01$) and market knowledge specificity ($\beta = .29$, $p < .01$). This supports H_{1a} and H_{1c}. The more market research that a company conducts, the greater the volume and

specificity of that firm's market knowledge. However, the relationship between MIGA and market knowledge tacitness is not significant, therefore H_{1b} is not supported. In the extant literature tacitness is embedded knowledge based on individual employee's experiences rather than on the acquisition of consumer or competitor knowledge (Nonaka, 1994).

Table 4 also shows that there is a positive significant relationship between market knowledge volume and product innovation performance, or PIP ($\beta = .41$, $p < .01$), and between market knowledge specificity and product innovation performance ($\beta = .30$, $p < .01$). However, there is no significant relationship between tacitness and performance. Thus, H_{2a} and H_{2c} are supported, but H_{2b} is not supported.

In order to test H_3, a median split was conducted on market uncertainty to create "high" and "low" market uncertainty conditions. A moderation analysis revealed that market uncertainty positively impacted the market knowledge tacitness → PIP relationship ($\beta = .32$, $p < .05$). That is, tacit knowledge has more impact on product innovation performance in conditions of high market uncertainty. A similar analysis was conducted using market knowledge volume and specificity, but market uncertainty did not have a moderating influence on those variables. Thus, H_3 is supported.

6. Discussion

This research was motivated by a desire to gain a greater insight on MIGA and market knowledge volume by expanding previous conceptualizations using input from industry experts. This study seeks to advance the marketing and innovation management literature by understanding the role of market information gathering mechanisms and market knowledge on PIP. The impact of market knowledge dimensions on PIP varies according to external conditions. Market knowledge volume and specificity are positively influenced by MIGA and also exert a positive effect on PIP.

This study proposes and validates a new conceptualisation of market information gathering activities which takes into account different sources of market data. Differentiating from prior studies, this study consolidates the dimensions of market knowledge breadth and depth into a single concept of market knowledge volume. This latter concept captures not only information on competitors' strategies and customers, but also differentiates between knowledge of retail customers and consumers (i.e. consumer behaviour) and includes knowledge of environmental forces (e.g. economic, social). These two new measures of MIGA and market knowledge volume are informed by input from industry experts and later validated by CFA using a survey of UK grocery firms.

This study sheds lights on the value researchers and managers need to place on market knowledge dimensions in product innovation and the importance of environmental conditions and firm's characteristics in the relationships between the market information gathering activities and specific market knowledge dimensions as well as the relationships between the latter and product innovation performance. The study supports and improves on De Luca and Atuahene-Gima's (2007) assertions that different types of market knowledge have different intrinsic properties, and that the different dimensions have a differential impact on performance. The findings have an impact on our understanding of market knowledge in the context of the RBV of the firm. The study provides empirical evidence for the proposition that market knowledge is a resource that can be controlled to create sustainable competitive advantages. Specifically, this study highlights the positive impact of tacit knowledge in uncertain environments, which supports the resource based contention that inimitable resources are the most beneficial to firms.

MIGA has a positive significant effect on the volume and specificity of market knowledge. Both market knowledge volume and specificity have a positive impact on product innovation performance. The role of tacit knowledge on performance of new products is

revealed when different market conditions are examined. The study points out the value of tacit knowledge in uncertain market environments, shedding light on the value of this type of knowledge (DeLuca and Atuahene-Gima, 2007; Goffin and Koners, 2011).

The managerial implications of accepting the resource based view of the firm in this way are exemplified by the construct market knowledge tacitness. In the first unmoderated model, MIGA does not have a significant relationship with tacitness supporting the notion that tacit knowledge is embedded through experience. Tacitness also proved to have an insignificant relationship with product innovation performance. However, in environments of high market uncertainty this relationship becomes positive and significant. These environments are examples of contexts in which market knowledge could become more difficult to communicate as a result of increased complexity. These environments also recognize the ability of the individuals involved to internalize processes that can achieve product success. In uncertain markets, it can be expected that more experienced individuals with exposure to similar situations and embedded knowledge as a result of those experiences are more important in guiding a firm through a tough economic market outlooks characterised by high uncertainty. This finding has important managerial implications as it determines the skills and experience of employees that are needed to make use of market knowledge in different circumstances. Under more stable and predictable market conditions, it may be advisable to devote more resources into capturing as much information as possible and less on experienced staff. Yet, under uncertain market conditions, resources may need to be devoted to more experienced staff who come with embedded, internalized knowledge and processes already in place.

From an industry point of view, there is value in the development of this research to examine what types of market research lead to different market knowledge dimensions. This paper pointed out that different market knowledge dimensions act as influencers of success in dynamic ways, their impact changing depending upon different internal and external

conditions. Understanding how these dimensions are created in the first place enable organisations to use their resources in a more strategic, targeted manner in the future. For example, if a firm's resource allocation to EPOS data over or under estimates the value of that data to their firm, then that represents ineffective management of their resources.

6.4. Limitations and directions for future research

This study has several limitations. First, the generalisability of our results is limited as we used data from the UK grocery sector. Although the sample size is within the limits suggested by Hair et al (1995), it is hard to make generalizations about an entire industry based on the study sample. As different innovation capabilities that may be sector specific (Shan, 2013) may impact product innovation and firm performance, future studies may test the proposed model in a more homogenous sector or replicate the model in other sectors.

Second, firms that had no innovations within two years prior were excluded from the study. The focus of this study was to analyse the innovation management process, thus we felt it was appropriate to only look at firms with recent innovations. Nonetheless, the inclusion of non-innovating firms would have led to greater breadth and generalizability.

Third, the measures of innovation performance do not distinguish between innovations that increase sales and innovations that result in greater efficiencies and cost savings. While this was not a specific focus of this study, we recommend that future studies consider the differences between cost saving innovations and revenue driving innovations.

Fourth, capturing latent constructs is inherently difficult in any survey research. We believe this is especially difficult for a construct like knowledge tacitness. By definition, a firm that holds tacit knowledge would have a difficult communicating it. Yet, we have asked our respondents to describe how difficult it is to understand and communicate their own

knowledge. While we did undertake the proper validation measures in this study (De Luca and Atuahene-Gima, 2007), we believe it may be worthwhile to explore and develop more objective measures of knowledge tacitness.

Fifth, it may be argued that we use information gathering activities as a proxy for volume of knowledge. Prior research has established a connection between the amount of industry and market knowledge a firm possesses and the amount of information gathering activities they have undertaken (Rynning and Anderson, 1994). Furthermore, while it may be difficult for a firm to quantify the volume of their own knowledge, it should be significantly easier for that firm to quantify the time and activities they have put into gathering information. Nonetheless, we acknowledge that market knowledge volume may be better captured through more objective measures.

Lastly, this research has described the use of market knowledge in the NPD process in terms of the RBV of the firm. However, RBV theory has been extensively criticized in recent years for not providing a detailed enough explanation of how firms operate in order to create sustained competitive advantage (Priem and Butler, 2001). Our exploration of knowledge tacitness in uncertain environments provides more detail on how a unique resource can be used to drive performance under specific conditions.

A greater understanding of how firms integrate knowledge into their organisations would provide a more nuanced understanding of how market knowledge can be used as a resource. Barney (1991) describes knowledge as a resource and market knowledge can be described as displaying valuable, rare, inimitable, and non-substitutable attributes. However, Srivastava, Fahey et al. (2001) highlight the fact that although market information and knowledge about competitors is central to developing competitive advantages, previous literature has not generally considered information and knowledge of the marketplace as an internal asset or capability. Instead, the marketing orientation of a firm is considered a

resource as it deals with the acquisition, integration, and dissemination of information and knowledge for the purposes of developing and implementing strategy (Srivastava, Fahey et al. 2001). Future research may attempt to address this issue in the context of the knowledge based view (KBV) of the firm by exploring the impact of theories, such as market orientation (Jaworski and Kohli 1993), dynamic capabilities (Teece and Pisano 1994), and the absorptive capacity (Zahra and George 2002) of a firm. In sum, we hope this study encourages future research on the impact of market knowledge types and gathering activities onto product innovation performance.

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Table 1. Quotes from Qualitative Interviews with Expert Judges

Construct	Description	Relevant Quotes from Expert Judges
Market Information Gathering Activities (MIGA)	Rationale for the use of EPOS, Panel, Loyalty card, Broader market trends and consumer focus groups in NDP activity	**Interviewee 1 – manager at Dunnhumby – Tesco Clubcard**: *"they use customer data like our own (dunhumby), they use EPOS data to understand the size of the market potential, they will use, in some cases, a lot of qualitative research so focus groups – would you buy this? Do you think this is a good idea?"* *"they use data on past performances, looking at launches within the category and forum and what's happened there, they will use broader market understanding – there's a big trend in organic, there's a big trend in healthy, therefore with our understanding that should affect how we launch our products. So those kind of understandings."* **Interviewee 2– Government Consultant:** *"sources of data would be, certainly continuous data from all the major providers of continuous data – TNS, Nielsen, dunnhumby. And quite often, not just the standard packages, but also the sort of some of the specialised packages that these providers would offer. So working with those companies to analyse and understand the data."* *"I think, trade journals, market reports, consumer reports, consumer lifestyle magazines are all vital sources of information. That can help reveal an opportunity that perhaps isn't currently being fulfilled in the market place"* **Interviewee 3– NPD Manager:** *"data we require is to know all about market size, all about what products are sold in that market, what's the pricing of that market? What's the size of the market, what competitors are doing, why are they doing it and we're not, what's the reason for that?"* *"from outside agencies like us (LFI), TNS, dunnhumby, Nielsen"* *"I always encourage small SME's to buy the Grocer because you often get a lot of survey information free of charge,"* **Interviewee 4 – Marketing manager, Dairy industry:** *"We'll deal with, in terms of market data, TNS, dunnhumby, Mintel, so we'll get various sources of research information. We do focus group information if we've got an idea and we just need to test the water to see if it's going to work or not going to work."* *"State of the nation stuff, is always on the agenda… a lot of it's what's in the media, so what's in the trade media."*
Market Knowledge Dimensions (Breadth, Depth, Tacitness	Expert view on knowledge of customers' needs, behaviour, and Competitors' strategies, economic and	**Interviewee 5– Manager at Dunnhumby:** *"I would massively advocate the value of observational studies, going to a store, understanding where your product is, who it's up against, what competitors prices are."* "*they'll buy into things like Mintel, maybe, where they'll get quite detailed reports about the state of the nation, what's happening etc. and any company that's producing food gets*

and Specificity)	social trends as sources of Market Knowledge (Volume).	*regular updates in terms of new regulations, what they can and can't do. they will have some kind of agency or in-house people that will deal with that sort of stuff for them. I think, yeah, in terms of trends and what's happening in the market place, that's another time when you use consultancies, you use agencies that specialise in what are the trends that are going to affect this category in the next ten years?"* **Interviewee 2– Government Consultant:** *"Go in the store, do your observational stuff, look what's there look how it's priced, evaluate how does your product fit, why would you want it to be out of line with the most expensive product? Without any marketing support, the chances are, the consumer's going to pick something that's cheaper than your product."* "*observation. That's where a smaller company might succeed. Purely and simply by talking to friends, relatives, and their small customer base. To talk about a product which certainly doesn't exist in the market. And when I talk about observational studies, quite often what we do is to simply stand in a number of different multiples and to actually look at opportunities that might exist or could exist that are not currently being fulfilled, against the core competencies of a food manufacturing client."* **Interviewee 3– Managed NPD launches for Birdseye and Walls:** *"we have a panel of kids on our centre in benchmarking products. So if we were launching a product for kids, we would bring 12 or so kids in here from the local school, sit them in a room, give them the product, they wouldn't see us, there would be a glass screen here, we'd be looking through, we'd see their reaction,"* **Interviewee 4– Marketing manager, Dairy industry:** "we spend a lot of time out looking at what other multiples are doing, but you can get to the point where those kind of ideas are exhausted, so we spread and we go down and look at people like Harrods, Selfridges, Fortnum and Masons, what are they doing, how are they drawing and attracting new customers?"

Table 2. Construct measurement of validity

Measure and Reliability	Description	Standardized Loading
Market Information Gathering Activities[1] (MIGA)	**Please indicate how useful the following types of information have been for your NPD activity:**	
Composite Reliability (CR) = 0.92	Supermarket loyalty card data	.79
Average Variance Extracted (AVE) = 0.67	EPOS data	.83
	Panel data (e.g. TNS and Nielsen)	.87
	Broader market trends	.76
	Consumer focus groups	.83
	Consumer surveys	.79
Market Knowledge Volume[2] (VOL)	**Please indicate the extent of your firm's knowledge of the following areas:**	
CR = 0.75	Our customers' strategies	.73
AVE = 0.69	Our customers' needs	.89
	Consumer behaviour	.90
	Our consumers' preferences	.93
	Competitors' strategies	.90
	Broader economic trends	.79
	Broader social trends (e.g. demographics, health issues)	.68
	Recent technological advances	.78
Market Knowledge Tacitness[3] (TACIT)	**Please indicate the extent to which you agree or disagree with the following statements:**	
CR = 0.93	Overall, our market knowledge is difficult to fully document in manuals or reports	.87
AVE = 0.77	Overall, our market knowledge is difficult to fully understand from written documents	.88
	Overall, our market knowledge is difficult to precisely communicate through written documents	.92
	Overall, our market knowledge is difficult to identify without personal experience in using it	.88

Market Knowledge Specificity[3] (SPEC) CR = 0.83 AVE = 0.63	**Please indicate the extent to which you agree or disagree with the following statements:**	
	It would be difficult for an employee of our to transfer market knowledge gained in our business to other sectors of the industry	.82
	Our knowledge of our competitors is specific to our business	.82
	Our market knowledge and skills are tailored to meet the specific needs of the market in which we operate	.79
	The sector in which we operate has unique characteristics, meaning that generic market knowledge is of limited value	.75
Market Uncertainty[3] (adapted from Jaworski and Kohli (1993); De Luca and Gima (2007)) CR = 0.93 AVE = 0.76	**Please indicate the extent to which you agree or disagree with the following statements:**	
	Customer needs and product preferences change quite rapidly	.89
	Market conditions are highly unpredictable	.93
	Customer product demands and preferences are highly uncertain	.90
	It is difficult to predict changes in customer needs and preferences	.77
Product Innovation Performance (PIP)[4] (adapted from De Luca and Atuahene-Gina (2007); Langerak et al. (2004, 2007)) CR = 0.94 AVE = 0.75	**Please indicate how well your new product launches have performed over the last two years with respect to the following stated objectives:**	
	Volume sales goals	.89
	Revenue goals	.93
	Sales growth goals	.90
	Market share goals	.77
	Return on investment	.88
	Profitability goals	.84

Notes: 1. Ten point scale (1=Not important at all; 10=Critically important); 2. Seven point scale (1=Very weak; 7=Very comprehensive); 3. Seven Point Scale (1=Strongly disagree, 7=Strongly agree); 4. Seven point scale (1=Very poor; 7=Very well)
Fit indices: Normed chi-square= 2.42; CFI=0.90; IFI=0.89; RMSEA = 0.08.

Table 3. Descriptive statistics and construct correlations

	Means	S.D	1	2	3	4	5
1 MIGA	5.42	2.90	0.67				
2 VOL	4.97	1.31	.458**	0.69			
3 TACIT	4.31	1.42	.050	.123	0.77		
4 SPEC	4.55	1.31	.344**	.415**	.462**	0.63	
5 PIP	4.81	1.37	.379**	.561*	.216**	.541**	0.75

Note: AVEs are on the diagonal; squared correlations are above the diagonal; correlations are below the diagonal.
** *p< 0.01*

Table 4. Results
R^2 PIP = 0.30; Normed chi-square = 2.51; CFI= 0.89; IFI = 0.89; RMSEA = 0.08
* *p<0.05*; ** *p<0.01*

Linkages in the model		Standardized path coefficient
MIGA --> Market knowledge volume	H1a	0.49**
MIGA --> Market knowledge tacitness	H1b	0.03
MIGA --> Market knowledge specificity	H1c	0.29**
Market knowledge volume --> PIP	H2a	0.41**
Market knowledge tacitness --> PIP	H2b	0.07
Market knowledge specificity --> PIP	H2c	0.30**
Market knowledge tacitness * market uncertainty --> PIP	H3	0.32*