

A CONTINGENCY VIEW OF NOVELTY: THE ROLE OF PRODUCT-SERVICE STRATEGY, SENSING CAPABILITY AND ENVIRONMENTAL TURBULENCE

Abstract

Purpose: The aim of this study is to examine (i) the impact of the fit between product-service strategy and sensing capability on novelty, and (ii) the potential moderating impact of contextual factors (i.e. technological and market turbulence) on novelty.

Design/methodology/approach: In line with the aim of the study, a quantitative approach was adopted and a multi-item scale survey was designed to collect primary data. Using a mixed mode survey, a total number of 491 questionnaires were collected from a sample of UK-based telecommunications firms. Multiple regression was employed to test the hypotheses and predict the outcomes.

Findings: The results support the positive contribution of a contingency approach to the study of the impact of the fit between product-service strategy and sensing dynamic capability on novelty. The results also partially confirm the reinforcing impact of technological and market turbulence on novelty.

Originality/value: The current study extends research on product-service strategy and sensing capability by adopting a contingency view which intends to serve two purposes: (i) to complement the existing reductionistic explanations, and (ii) to explore how the relationship between product-service strategy and sensing capability could create novelty as well as the degree to which this relationship could be moderated in light of the external contextual factors.

Keywords: Product-service strategy, sensing capability, novelty, environmental turbulence, value creation

1. Introduction

The term novelty could have pejorative meaning and refer to a mere innovation. While innovation is the act of introducing or doing something new from customers' perspective, novelty connotes the quality of being new in terms of products and services, effective and innovative marketing channels, and optimised distribution costs from a firm's perspective (Amara et al., 2008). The role of novelty as a value driver (Lepak et al., 2007) has even become more crucial in the current e-business marketplace (Zott and Amit, 2010). One explanation is that the market has the potential to offer endless innovative ways to enhance novelty through mechanisms such as removing geographical and physical boundaries and offering a two-way communication opportunity for stakeholders (Dubelaar et al., 2005; Zott and Amit, 2008). As a result, the questions of how firms could generate novelty and what factors influence novelty creation have remained central to the debate in the extant literature (e.g. Nieto and Santamaria, 2007; Ellonen et al., 2009; Mention, 2011; Camison and Monfort-Mir, 2012). Although previous studies of value creation activities have offered considerable insights into sources of value creation in firms (see Amit and Zott, 2001), they typically do not delve into the significance of novelty in the whole value creation process under turbulent market environment (Arama et al. 2008). This has led to a relative neglect of theoretical and empirical attention to the study of novelty as a potential determinant of firms' innovative performance and new growth opportunities (Koc and Bozdog, 2017).

In addition, a key tendency of previous research appears to be on the increased emphasis upon the suitability of a methodological reductionism to the study of novelty. The reductionistic approach explains the entire value creation process of novelty through simple and individual independent parts in isolation (e.g. Bao et al., 2012; Im et al., 2013; Koc and Bozdog, 2017). Given the dynamic and complex nature of novelty and factors influencing its potential for value creation, there has been a growing consensus that novelty should not be

explored at its simplest level and by its individual constituent elements. In this respect, there has been a massive amount of attention paid to the application of contingency theory to the study of novelty (e.g. Atuahene-Gima et al., 2005; Zott and Amit, 2008; Pullen et al., 2012). A contingency approach to the study of novelty serves two purposes: (i) it emphasises the collective and interactive impact of all capabilities and strategies on novelty (e.g. Acur et al., 2012), and (ii) it allows us to understand the moderating impact of contextual factors which may strengthen or deter firms in realising the value creation potential of novelty. Proponents of contingency theory (e.g. Schoonhoven, 1981; Drazin and Van de Ven, 1985) argue that since firms are composed of many different interrelated subsystems, they are complex and dynamic entities and therefore are subject to the influence of a range of contingency-based internal and external factors (Donaldson, 1996). Such high level of dynamism and complexity of firms necessitates a more robust and thorough theoretical lens through which novelty can be exploited as a value source. Whilst previous studies offer rich insights into how competitive strategies or dynamic capabilities can result in value-added novelty, yet they have left room for further empirical scrutiny of the degree of 'fit' between competitive strategies and dynamic capabilities and the resulting implications for the value creation potential of novelty (see Greenwood, 2008). There is also no consensus on the impact of contextual factors on the fit between product-service strategy and sensing capability and the resulting consequences for realising the value creation potential of novelty under a highly turbulent business environment.

The current study makes an attempt to respond to these challenges with both theoretical and empirical contributions. We argue that the traditional reductionistic explanation of product-service strategy and sensing capability relationship and the resulting outcomes for creating novelty oversimplifies the nature and extent of the relationship, largely owing to the fact that it undermines the inherent complexities and uncertainties of the existing turbulent market

environment. A contingency approach to the study of novelty is therefore more adaptive and attuned to the reality of business environment particularly in the current digital transformation era. As such, the results of our study offer practical insights into strategy formulation and execution of firms operating in the information and communication technology (ICT) sector. More specifically, our findings highlight the paramount role of an appropriate product-service competitive strategy that incentivises novelty creation under turbulent and uncertain context of current business environment.

The primary aim of this study is therefore two-fold: (i) to examine the impact of the fit between product-service strategy and sensing capability on novelty, and (ii) to explore the potential moderating effects of environmental variables (i.e. technological turbulence and market turbulence) on the relationship between the fit and novelty.

2. Theoretical background: A contingency view on novelty

The contingency theory is based on the premise that firms as open systems are required to achieve alignments and good fits between their internal needs and the environmental circumstances, if they are to sprout, grow, adapt and succeed (Heracleous and Werres, 2016). In a hyper-turbulent environment, this theory enables us to conceptualise the fit between product-service strategy and sensing capability and explicate the contextual impact of environmental turbulence on the ability of e-businesses to create novelty. In contrast to a conventional, narrow reductionistic approach, the contingency theory adopts a collective and holistic approach which has the potential to analyse the nonlinear, interactive and contingent interrelationships between different variables simultaneously (Pullen, et al., 2012). It implies that firms create value by virtue of fitting their strategies to the firms' internal and external contexts (Venkatraman and Prescott, 1990; Zott and Amit, 2008). According to Schoonhoven (1981, p. 35) "when contingency theorists assert that there is a relationship between two

variables, ... which predict a third variable ..., they are stating that an interaction exists between the first two variables”. Taken together, this brief review suggests that the contingency theory is a useful lens through which the nature and extent of the impact of the relationship between product-service strategy and sensing capability on novelty under turbulent business environment can be examined.

2.1 Key Variables and Operational Definitions

Since the current study makes an effort to develop a framework for understanding the impact of the relationship between product-service strategy and sensing capability on novelty under turbulent environment, a brief discussion of each of the research constructs is given below.

Novelty: It is defined as “the adoption of new activities (content), and/or new ways of linking the activities (structure), and/or new ways of governing the activities (governance)” (Zott and Amit, 2010, p. 6). The literature on the benefits of novelty reveals that novelty has the potential to increase customers switching cost, guard against increasing churn, and consequently create more value for firms (e.g. Peng et al., 2013). Thus, novelty is viewed as one of the key value drivers in e-businesses. Novelty has been operationalised through several measures such as being a pioneer in utilising e-business solutions (Zott and Amit, 2007), innovative ways of cooperation with customers/suppliers (Eikebrokk and Olsen, 2007), continuous innovation in e-business product/service offerings (Liao et al, 2009), continuous introduction of innovations in a business model (Zott and Amit, 2008) and the ability to bring together new participants (Zott and Amit, 2007). These operationalisations of novelty imply that it can create value not only for customers, but also for all engaging participants from a firm’s perspective.

Product-service strategy: Given the focus of the current study on novelty, it is important to distinguish the term from product-service strategy and sensing capability. While novelty refers to value creation by a firm for its participants such as suppliers, distributors,

competitors and customers (see Zott and Amit, 2010), product-service strategy is viewed as a firm's long-term competitive direction to differentiate itself from its competitors in terms of its product/service offerings. A key reason for using product-service strategy in the current study lies in its importance and role in creating superior performance and achieving competitive advantage (see Porter 1980). As Dess and Davis (1984, p. 469) have observed, this type of differentiation strategy "requires that the firm create something, either a product or a service, that is recognised industrywide as being unique, thus permitting the firm to command higher than average prices".

Sensing capability: The adoption of sensing capability as the second independent variable in the current study lies in the assertion that firms need to embrace new elements of competition which offer a well-rounded, multidisciplinary approach to organisational decision-making, if they are to succeed in the current technology-driven and turbulent business environment (see Teece, 2007, 2010; Schilke and Goerzen, 2010; Roberts and Grover, 2012). Teece et al. (1997, p. 521) delineate sensing capability as "the ability to calibrate the requirements for change and to effectuate the necessary adjustments would appear to depend on the ability to scan the environment, to evaluate markets and competitors, and to quickly accomplish reconfiguration ahead of competition." Emerging from the dynamic capability view (DCV), sensing capability can be characterised by a range of potential benefits for firms in particular with regard to exploring technological opportunities, probing markets, listening to customers, along with scanning the other elements of the business ecosystem (Teece, 2011). In short, a key reason explaining increasing importance of sensing capability pertains to its role in developing, integrating and configuring firms' tangible and intangible resources and the pertinent capabilities to address changes in the environment (Teece et al., 1997; Teece, 2012). Given the accelerating rate of technological change in the turbulent context of telecommunications (the focus of the current study) and the exponential growth of e-

businesses, e-businesses are to lay more stress on sensing capability and consequently identify opportunities in the electronic market.

A review of the literature pertinent to the effect of environmental contingency factors on novelty in the telecommunications industry highlights technological and market turbulence as the two main determinants of value creation. These two factors are also known under environmental dynamism umbrella in some studies (e.g. Drnevich and Kriauciunas, 2011) or environmental turbulence in others (e.g. Baganza et al., 2009; Hung and Chou, 2013). Technological turbulence denotes the frequency and unpredictability of technological changes in the environment (Pavlou and El Sawy, 2011). These changes may not solely influence firms, but they also directly affect the entire supply chains that firms are working in and therefore, impact on the overall competition in the market (Drnevich and Kriauciunas, 2011). To explicate this contextual factor, Baganza et al. (2009) endorse two dimensions of rapidity and unpredictability of the technology changes. Market turbulence is defined as the frequency of major changes in the market (Pavlou and El Sawy, 2011). Attributes of a turbulent market include dynamic (Baganza et al., 2009), unstable (Drnevich and Kriauciunas, 2011), constantly changing (Pavlou and El Sawy, 2011), hostile (Covin and Slevin, 1989), volatile (Calantone et al., 2003) and heterogeneous business environment (Helfat and Winter, 2011).

2.2 A Critical Reflection on the Literature Review

In parallel with the importance of a firm's internal possessions in a turbulent market, a special consideration has been devoted to the role of dynamic capabilities, i.e. sensing. Several scholars underpin the positive role of sensing in strengthening the ability of a firm to outperform and secure a competitive advantage in the current dynamic, digital, turbulent market environment. For instance, Eisenhardt and Martin (2000) talk about sensing capability as the most suitable capability in a relative turbulent environment. Drnevich and Kriauciunas

(2011) argue in favour of the appropriateness of sensing capability for creation of superior value in a turbulent electronic market. Similarly, Pavlou and El Sawy (2010) highlight the suitability of dynamic capabilities for value creation. They also posit that dynamic capabilities can assist a firm to face the challenges of a turbulent digital environment and create an edge over its competitors. Amara et al.'s (2008) study of the impact of sensing and learning capabilities on novelty concludes that both sensing and learning through searching, training, doing, using and interacting capabilities positively improve the degree of novelty in SMEs. In a recent study of Brazilian national pharmaceutical companies, Torres and Hasenclever (2016) demonstrate that firms with a greater level of sensing and seizing capabilities can effectively find and absorb opportunities related to foreign technology and accordingly can create higher degree of novelty and achieve competitive advantage. Taken together, these bodies of literature seem to suggest a correlation between novelty and dynamic capabilities, rather than proposing a fit between dynamic capabilities and the overall competitive strategies of a firm.

Technological turbulence is also one of the highly debated areas in the context of Information Technology (IT)/Information Systems (IS) and telecommunications (e.g. Wu et al., 2003; Pavlou and El Sawy, 2010). This is partially because the digital area is recognised as a highly uncertain and dynamic field in which technological turbulence is constantly emerging. This implies that telecommunications firms are increasingly under pressure of turning a high volume of changes to opportunities to further retain their competitive position in the market (Jaworski and Kohli, 1993). Tumultuous change and the resulting environmental uncertainty (Buganza et al., 2009) require telecommunications firms to utilise their dynamic capabilities as mechanisms to work more flexibly and convert the threats to opportunities. Advanced sensing capability is needed to equip an emerging firm to quickly identify technological shifts

(Drnevich and Kriauciunas, 2011), i.e. both incremental and evolutionary changes (Lynn, 1998).

The paramount importance and consequences of market turbulence in a telecommunications context is undeniable. The short-lifecycle technology products and the high pace of innovation in the telecommunications sector pose serious challenges to managers in making their strategic decisions and preventing their competitive advantage from erosion (Zhou et al., 2005). Calantone et al. (2003) take a contingency view towards market turbulence and argue that firms that experience market turbulence may only obtain a temporary competitive advantage – owing to the high rate of product/service innovation. This in turn demands a constant renewal of resources and capabilities. Overall, the preceding review suggests that there is no consensus among scholars on the effect of technological and market turbulence on the value-creating potential of novelty. While some researchers (e.g. Jaworski and Kohli, 1993) contend that this effect is insignificant, others (e.g. Pavlou and El Sawy, 2011) expound it as a positive moderating association. Given such mixed research findings, managers and strategists should be reminded to pay more attention to strategic decisions in particular with regard to the potential impact of environmental turbulence (Theodosiou et al., 2012).

3. Conceptual framework

Based upon the insights gained from contingency theory (Wilden et al., 2013; Van de Ven et al., 2013) and building on the extant literature, a conceptual framework was developed (see Figure 1) and a list of hypotheses was derived. As Figure 1 indicates, novelty is obtained through the capacity of a telecommunications firm to fit its product-service competitive positioning strategy into its internal sensing capability. Indeed, grounded on the notion of contingency view, firms are expected to create higher novelty when their competitive strategy

of product-service differentiation is strongly underpinned by their capability to sense the changes in the external environment. The proposed framework suggests that novelty cannot be thoroughly studied if we do not factor in the environmental context. Thus, the incorporation of context into the study of novelty implies that the degree of strategic fit between product-service strategy and sensing capability is contingent upon environmental context and that the value-creating potential of novelty may vary in different technological and market contexts.

-----*Insert Figure 1 about here*-----

As Figure 1 shows, the proposed conceptual framework entails several different but related constructs associated with the value-creating potential of novelty in a turbulent business environment. While these variables have their own preferred theoretical and epistemological positions, it is argued that developing a greater understanding of novelty can only be achieved when the collective and interactive impact of different determinants of novelty are examined under the complex and dynamic context of environmental uncertainty. This argument is rooted in objectivism ontology and epistemology which considers firms as real entities and assess their strategies, capabilities and value sources through a more thorough and realistic lens. Further explanations for the relationships between the research variables and formulation of research hypotheses are given below.

3.1 Research Hypotheses

Several studies have attempted to elaborate on the importance of product-service strategy by explicating its contribution to a firm's value creation. For example, Roberts' (1999) study of the US pharmaceutical industry shows how the adoption of a proactively innovative strategy contributes to high profitability return. Similarly, Lee et al. (2000) suggest that fast and early movers in a market are its outperformers. Early and fast movers are those firms that are quick in sensing and seizing the opportunities in the market and as such they are able to develop

new products/services and consequently create novelty. Lumpkin and Dess (1996) report that entrepreneurial strategy of a firm is positively associated with performance. Thus, firms with much innovative product-service orientation are more likely to gain a superior return. Zhu et al. (2006) take the argument further as they put forward the significant role of sensing capability to enhance innovation in a firm's entire value chain. Wiengarten et al. (2013) underscore the necessity of this type of dynamic capability in creating value. They argue that telecommunications firms may outperform, only if they dynamically maintain an effective fit between their differentiation strategy and their sensing capability. That's, the ability to offer highly innovative and tailored products and/or services to customers may not be possible particularly when the adopted competitive strategy is not supported by a high ability of a firm to sense and identify new opportunities in the market.

Arguably, product-service strategy may be difficult for competitors to imitate, particularly in electronic markets. This argument could hold true in particular when the adopted strategy is underpinned by a firm-specific sensing capability. This rising synergy between the strategy and capability can provide firms with the ability of 'improvisational capabilities' (Pavlou and El Sawy, 2010). Hence, telecommunications firms can succeed if they have the ability to utilise new Internet-based technologies as a means to extract new ideas from their main sources of innovation, i.e. customers. In this respect, it is rather easy to find those firms which adopt product-service strategy to generate a great level of novelty. This is because telecommunications firms place emphasis on identifying the key attributes of products and services as effective means of responding to customers' needs. It can therefore be argued that firms could pursue superior novelty in a number of ways: allocating resources through sensing capability, and providing innovative value-added products and/or services to the customers through adopting a distinctive product-service strategy. Together, these arguments suggest:

H1: The fit between product-service strategy and sensing capability will create superior novelty.

In a technologically turbulent environment, a telecommunications firm is less able to predict the applicability of new technologies. In addition, stakeholders are less willing to employ IT to share information unless the firm benefits from high-level dynamic capabilities to sense and scan the environment (Arend and Bromiley, 2009). Under conditions of high market and technology unpredictability, it is very difficult for a firm to assess opportunities that can be derived from new technological changes (Hung and Chou, 2013). However, it has been suggested that managers must cope with these changes with greater R&D investments and capability development (Slater and Narver, 1994). In fact, firms whose sensing capability support their proactive product-service strategy have the ability to innovate product and service offerings and create novelty in a technologically turbulent environment (Ngamkroekjoti et al., 2005).

Monitoring and reacting to technological turbulence through the Internet-enabled technologies may aid telecommunications firms to take the most advantage of its dynamic capabilities through decreasing or even neutralising the negative effect of technological changes on its value creation ability. Wheeler (2002) argues that those sensing capabilities that provide firms with more opportunity to improve innovative abilities could be viewed as differentiated abilities of the pioneer firms from those which are lagging behind. However, it is worth noting that as IT and e-business solutions enable telecommunications firms to understand and respond to customers' needs in a timely manner, those telecommunications firms that successfully deploy high-level sensing capability are expected to outperform their competitors (Liu et al., 2011).

As technological dynamics may lead to differences between existing and ideal dynamic capabilities (Pavlou and El Sawy, 2011), as well as between current and planned competitive

strategies, developing a fit between competitive strategies and dynamic capabilities may enhance the firms' novelty. Hence, if technological turbulence moderates the impact of the fit on novelty, firms seeking to create a higher level of novelty must formulate their product-service strategies aligned to their sensing capability and technological changes in the environment. It is therefore expected that the influence of the fit between product-service strategy and sensing capability on novelty to be moderated by the level of technological turbulence. In other words:

H2: The impact of the fit between product-service strategy and sensing capability on novelty is positively moderated by the level of technological turbulence.

A turbulent market provides firms with new opportunities (Pavlou and El Sawy, 2011), which require appropriate employment of dynamic capabilities (Drnevich and Kriauciunas, 2011) in support of planned competitive strategies. The proposed effect of the fit between product-service strategies and sensing capability on novelty is likely moderated by the level of market turbulence. One explanation is that innovative and entrepreneurial telecommunications firms can create a higher level of value in a turbulent marketplace (Pavlou and El Sawy, 2011). These firms are more likely to adopt product-service strategies, thereby yielding a higher level of sensing capability. Prior research reveals that market turbulence causes firms to become innovative in sustaining their market position (Bao et al., 2012). Taking these two views together, one can conclude that pioneer firms which adopt product-service strategy are more likely to create superior novelty in a turbulent market. However, these firms also need to enhance their sensing capability in a manner congruent with their strategic direction, if they are to survive and succeed in a turbulent market.

Prior research indicates that sensing capability positively contributes to firms' value creation under high-level market dynamism (Drnevich and Kriauciunas, 2011). This is because firms operating under highly turbulent business environment tend to perform more flexibly,

innovatively, and quickly address the emerging changes in the market. Hence, a rapidly changing marketplace requires firms to adopt a higher level of sensing capability for observing and adapting to changes in the market (Pavlou and El Sawy, 2011). This in turn could lead to a higher level of novelty by the firm. In other words, the more changeable a market, the greater the ability of a telecommunications firm to respond to its participants' needs with innovative offerings. In fact, those firms that experience greater market turbulence tend to be prospectors, rather than defenders (Zhu et al., 2004). Overall, firms whose product-service strategies underpin their sensing capabilities and vice versa are less likely to be vulnerable to market uncertainty. Rather, they are expected to be more flexible and responsive to market needs and even influence the market to create more value. These arguments suggest that:

H3: The impact of the fit between product-service strategy and sensing capability on novelty is positively moderated by the level of market turbulence.

4. Methodology

4.1 Sampling

The data were obtained through a primary self-completion survey instrument. The method enabled us to not only collect a larger sample of data for population representativeness, but also resulted in high internal validity (Easterby-Smith et al., 2008). The development of the draft survey instrument followed the 10-step design process proposed by Neelankavil (2007). Upon completion of the draft survey instrument, a pilot test was undertaken to ensure (i) the reliability of the scale, (ii) comprehensiveness of the contents, and (iii) an appropriate wordings of the survey. Given the aim of the current study and consistent with previous contingency research, a single industry was chosen for survey data collection. The choice of single industry helped control the moderating effects of industry-related variables (Pollalis,

2003). This was particularly crucial for the current study as industry effects on both competitive strategies and dynamic capabilities were previously identified (e.g. Drnevich and Kriauciunas, 2011). In order to collect large-scale single industry data the UK telecommunications industry was chosen which included firms operating in wired, wireless, and satellite broadcasting operations (Companies house, 2015). A single key-informant survey design was employed to collect the required data from the most reliable source of information from each firm. Despite potential bias associated with data from a single respondent (Podsakoff et al., 2003), we endeavoured to largely minimise the bias by collecting data from the most knowledgeable sources in each firm (e.g. directors, top managers or founders of the telecommunications industry).

The process of data collection lasted nine and a half months and yielded a total number of 491 usable responses. Of these, some 289 respondents filled in the questionnaire via the web-link, 157 firms responded after one or two phone call reminders, and the remaining 45 questionnaires were collected via postal mail. This multi-method process of data collection yielded a 19% response rate (491 useable data of 2845 distributed questionnaires). In total, a sum of 87% of the respondent population were senior managers, who were as the most informant individuals in the firms (Gruber et al., 2010). Over half of the responding firms (n=267) were established in early 2000. Some 76.1% (n=374) of the firms had online presence for less than 10 years. Only 94 firms (less than one fifth of the sample) considered themselves as purely online firms. This showed that the majority of our respondents had both online and offline business models. In terms of size, the majority of the participants were Small and Medium Enterprises (SMEs), with less than 200 employees (see Ramanathan et al., 2012). In order to ensure whether the survey data gathered from the two modes of online and offline data collection methods (surveys) could be combined, Chi-square test was undertaken to examine for nonresponse bias. Analysing the results of this test for five items of firm's age,

time online, scope of operation (i.e. percentage of sales outside the UK) and firm's size (i.e. two items of number of full time employees, and total sales in the most recent year) demonstrated no significant difference ($p > 0.05$) – a further proof of discriminant validity (Anderson and Gerbing, 1988). Furthermore, a comparison of early versus late survey respondents revealed no response bias in the dataset. Given the nonexistence of response bias in the data, the two sets of the collected data were combined to form a single dataset for further analysis.

4.2 Measures

Based on an extensive literature review, multiple-item (measured on a seven-point scales) were developed to operationalise the research variables for further empirical testing. Six measures for product-service strategy were adopted from various sources (e.g. Zahrah and Covin, 1993; Pelham and Wilson, 1996; Spanos and Lioukas, 2001; Gonzalez-Benito and ISuarez-Gonzalez, 2010; Parnell, 2011). Likewise, seven measures for assessing sensing capability were adopted from prior work (e.g. Pavlou and El Sawy, 2006; Hulland et al., 2007; Liao et al., 2009; Pavlou and El Sawy, 2011). For the dependent variable (i.e. novelty) seven items were taken from studies pertinent to e-business context (e.g. Eikebrokk and Olsen, 2007; Zott and Amit, 2007; 2008; Liao et al., 2009). Finally, multiple measures were adopted from previous studies related to the moderating effect of technological and market turbulence on the fit between product-service strategy and sensing capability (e.g. Jaworski and Kohli, 1993; Pavlou and El Sawy, 2011; Lee and Wong, 2011; Acur et al., 2012). Additional data were also collected to remove any confounding effect on the results. These data included: (1) the number of employees and natural log of sales revenues to indicate firm's size; (2) year of establishment; (3) the number of years that the firms had online presence to indicate time's online, (4) business model, i.e. purely online or online and offline

(click-and-brick model) and (5) the percentage of sales outside the UK as an indicator of the scope of operations (See Appendix A for a copy the questionnaire survey).

4.3 Reliability and Validity

In order to establish reliability and validity of the questionnaire (Churchill, 1979), the initial draft was discussed with two parties of academic experts and practitioners, who were both familiar with the research phenomenon and had experience with the telecommunications industry. Several comments, in terms of structure, layout, items, wordings, etc. were highlighted by both parties. The comments were addressed and incorporated into the final draft of the questionnaire survey. The content or logical validity of the research instrument was further secured – owing to the fact that all items in the questionnaire were developed based on prior reliable sources. Principal Component Analysis (PCA) was then employed to ensure scale validity (Fabrigar and Duane, 2012). PCA was performed to verify whether the items employed for measuring the constructs of product-service strategy, sensing capability, novelty and the two contextual factors were accurately gathered and classified. In so doing, the Statistical Package for Social Sciences (SPSS v.22) was used to verify the factor structure and determine items that needed to be removed from the dataset. Consistent with prior research (e.g. Song et al., 2008), the cut-off factor loading of 0.4 was considered for removal. Hence, items with factor loading equal or below the cut-off point were considered for deletion. Moreover, varimax rotation with eigenvalue greater than 1.0 was employed for factor inclusion and items with lower eigenvalue were removed accordingly. Overall, one item of product-service strategy, three items of technological turbulence and two items of market turbulence were screened out.

Next, we used Cronbach's (1951) alpha to determine the internal consistency or reliability of the items in the survey instrument (Chin, 1998). Nunnally (1978) recommends a minimum level of 0.7 as an acceptable level for Cronbach's alpha. All scales yielded an alpha score

greater than the recommended value of 0.7. Consistent with prior research (e.g. Joshi et al., 2003; Gruber et al., 2010), correlation analysis was employed to examine the possible relationships between the factors. As illustrated in Table 1, the correlations between the variables were positive and the strength of the relationships varied across the variables. To test for the presence of any autocorrelation, Breusch–Godfrey test (Breusch, 1978; Godfrey, 1978) was employed. Under the null hypothesis of no auto-correlation, Breusch–Godfrey test (which involves an auxiliary regression analysis) revealed no danger of auto-correlation in the dataset.

-----*Insert Table 1 about here*-----

Having secured the validity and reliability of the research constructs and the correlation analysis, the next section presents the results of the data analysis.

4.4 Data analysis

As a broadly applicable method to verify hypotheses, multiple regression was employed to predict the outcomes, i.e. novelty arising from the fit between product-service strategy and sensing capability (H1). As Table 2 shows, both product-service strategy ($\beta = .165$, t value= 4.112) and sensing ($\beta = .406$, t value= 10.624) positively influenced the novelty creation in the telecommunications firms ($p < 0.001$). By using this collective model, 40.7% of novelty variation was explained by the fit between product-service strategy and sensing capability. Hence, H1 is supported.

-----*Insert Table 2 about here*-----

The moderating impact of the two contextual factors of technological and market turbulence (depicted as H2 and H3 in Figure 1) was tested using a hierarchical moderated regression analysis. This special statistical analysis has been extensively used in previous work (e.g. Joshi et al., 2003; Hung and Chou, 2013). Using this method in the current study required the authors to run seven models. MODEL 7, which was the most comprehensive model,

evaluated the interactions of both independent variables with each moderator. A careful consideration of this model would be crucial in order to accept/reject the proposed hypotheses (H2 and H3). The results of running these seven models for each hypothesis are outlined in Table 2.

There is strong evidence to support a positive significant moderating effect of technological turbulence on the impact of the fit between product-service strategy and sensing capability on novelty (H2). As can be seen from MODEL 7 of Table 2, the interaction terms accounted for a significant increase in the R squared, from 0.239 in MODEL 1 to 0.450 in MODEL 7. Having compared MODEL 4 (without considering the interactions) to MODEL 7, the results show that although the interaction terms could not considerably add to the explanation of novelty, MODEL 7 represented the highest goodness of fit ($R^2 = 0.450$). Given this interpretation, H2 is supported. However, the results in MODEL 7 of Table 2 indicated an insignificant relationship between both interactions, i.e. product-service strategy \times market turbulence and sensing \times market turbulence, and novelty. As the findings exhibit, although the positive contribution of the moderator to the value source is undeniable (see Table 2, MODEL 4: $\beta = .167$, t value= 4.564, $p < 0.001$, MODEL 5: $\beta = .201$, t value= 4.727, $p < 0.01$ and MODEL 6: $\beta = .183$, t value= 4.932, $p < 0.001$), its conjunction with two predictors of product-service strategy and sensing capability was not deemed to be statistically significant. This indicates that there is not convincing evidence to accept H3 and it should therefore be refuted.

5. Discussion

The results of the first hypothesis can be discussed at two levels. First, consistent with prior research (e.g. Han et al., 1998; Soto-Acosta and Merono-Cerdan, 2008; Teece, 2010), product-service strategy and sensing capability were seen to positively contribute to the value

creation. For instance, Verona and Ravasi (2003, p. 599) argue that sustainable novelty creation may not be accessible, unless a firm develops its dynamic capabilities in such a way that they allow the simultaneous and continuous sensing and seizing the market opportunities. Second, the current study provides evidence to underscore the positive impact of the fit between product-service strategy and sensing capability on novelty. This finding accords with that of Miles et al. (2012) who argue that firms which adopt product-service strategy must continuously change their product/service lines and compete through sensing and seizing new market opportunities, if they wish to deliver novelty. To do so, they inevitably require a high level of capability to spot opportunities and threats in the environment, and consequently shape/interpret new opportunities and neutralise threats (Schilke and Goerzen, 2010). This argument underpins the recent increasing number of telecommunications firms which make attempt to employ highly developed web-based technologies (e.g. data mining and web mining applications) as mechanisms to conduct the activities of sensing capability. So, e-businesses operating in the telecommunications industry may have greater opportunities to exercise sensing capability compared to their brick-and-mortar competitors. It is argued that sensing activities must support and be supported by product-service strategy. This argument is based on the premise that crafting and executing competitive strategies based on inadequate or inaccurate market information are less conducive to value creation (Rashidirad et al., 2014). In a similar vein, Watson et al. (2007) observe that firms can create novelty, if they have the right capability to calibrate the needs for change and sense new ideas from customers. This seems more crucial in the context of the UK telecommunications not least because it is subject to a highly developed and turbulent business environment in which frequent innovations in technology alter customers' needs and expectations rapidly and constantly.

Moreover, the analysis indicated that technological (H2) and market turbulence (H3) positively contributed to novelty creation (see models 4 in Table 2). This finding which is consistent with previous research (e.g. Davis et al., 1991; Chakravarthy, 1997) suggests that firms operating in high levels of environmental uncertainty and unpredictability tend to respond more flexibly, proactively and quickly to yield novelty and to achieve a sustainable advantage. However, technological turbulence was found to be correlated to the relationship between product-service strategy-sensing capability fit and novelty. One explanation is that the firms operating under rapid technological changes have come to realise that the key to foster novelty is to strongly fit their product-service competitive strategy into their internally driven sensing capability (see Hung and Chou, 2013). The reinforcing impact of technological turbulence has been verified in the seminal study of Pavlou and El Sawy's (2011). Similarly, Chakravarthy (1997, p. 69) asserts that "in turbulent environments, market leaders must repeat innovations, establish customer networks, sense the flow of new products, and share responsibility for new strategy throughout the firm. They must also balance for leveraging, strengthening, and diversifying its distinct assets or skills." The findings of the current study conform to the past research evidence and reveal a positive link between product-service strategy and value/novelty (e.g. Calantone et al., 2003) as well as sensing capability and value/novelty (e.g. Drnevich and Kriauciunas, 2011; Lin and Wu, 2014). Unsurprisingly, the relationship between product-service strategy-sensing fit and novelty was found to be only moderated by technological turbulence. This is largely because rapidity and unpredictability of advances in technology in telecommunications sector are much more noticeable than the consequent changes in the market. However, it should be noted that high levels of shifts in technology could make the understanding of participants' expectations more complex, and this in turn could make the process of novelty development more challenging (Song and Montoya-Weiss, 2001; Lee and Wong, 2011). In a digital

marketplace of telecommunications, it appears that the impact of such potential threat may not be viable, as IT aids firms to act and make strategic decisions much quicker (Luse and Mennecke, 2014).

These findings imply that environmental dynamics, particularly technological turbulence, contribute towards the creation of superior novelty in the telecommunications firms. As our findings show, a fundamental factor for creating novelty in a turbulent environment is not to propose innovative and complementary products/service through maintaining a long-term relationship with stakeholders and enhance the efficiency ahead of competitors. Rather, it is to yield firms ahead of the recognition of the customers' needs (Jaworski and Kohli, 1993). This requires managers and practitioners to continuously improve their novelty through both developing and maintaining a dynamic fit between their product-service strategy and sensing capability as well as addressing the significant impact of technological changes. Hence, managers' underestimating of the moderating role of technological turbulence alone would not be enough to reap the full benefits of a novel business model. Contingency approach adopted in the current study guides practitioners in evaluating the 'fit' between product-service strategy and dynamic capability and technological and market turbulence in such a way that results in optimal novelty creation. However, it should be noted that the contingent view defended in this study should not be understood as an ideal approach to managing the firm and its environment. One explanation is that a contingency approach could motivate managers to allow themselves to change to a behavior or adopt a strategy that does not bring competitive advantage to the firm. That is, a contingency view could result in a reactive approach to managing a firm – thereby encouraging managers to assess and manage the environment to only avoid undesirable environmental concerns. Thus, firms should not only adjust themselves to the market requirements or adopt a strategy to reduce market or external pressure (i.e. disruptive behavior), but also and more importantly, they should avoid

behavioural biases and actions that diminish the firm's value and undermine its sustained performance.

6. Research contributions

6.1 Theoretical Contributions

Contingency theory enhances understanding of the interactive and complex interplay between all components of a system and at different level of explanation. It guides organisational scholars in their understanding of how a holistic pattern of constructs is associated with a dependent construct (Meyer et al., 1993). This study empirically evaluates the nature and extent of the fit between product-service strategy and sensing capability. The research finding on the relationship between the strategic fit and novelty is a meaningful contribution to the extant knowledge. This is largely because the relationship has been assessed through the collective lens of contingency theory. As Short et al. (2008) have observed, much of the existing research on the topic has adopted a reductionistic approach which has in turn undermined the holistic and nonlinear approach of contingency theorising in the field (Van de Ven et al., 2013).

Our findings indicate that adoption of a broader view of firms can result in a better understanding of novelty creation. This in turn could inspire further research exploring the complex nature of novelty creation within the internal and external context of firms. We extend the scholarly inquiry into dynamic capabilities as a contingency factor. While the emphasis has traditionally been on the firm's basic internal factors (e.g. structure and culture) as mechanisms for novelty creation, our study makes an attempt to assess the ability of firms to create novelty through focusing on dynamic capabilities and their interplay with competitive strategies. These findings constitute a theoretical extension of the literature by providing new empirical insights into the prior untested conceptualisations of the fit between

competitive differentiation strategy and dynamic capability (See Rashidirad et al., 2015). More specifically, our findings extend the debate on the more specific type of dynamic capabilities (i.e. sensing) and its interrelationship with product-service strategy. In fact, our study utilises the concept of sensing capability as the most crucial determinant of firms' competitiveness (Pavlou and El Sawy, 2011). Hence, one of the theoretical implications of the current study is to highlight sensing as one of the inevitable capabilities of any firm in the current complex, turbulent and dynamic environment. Sensing allows firms to move much faster than others and gain competitive advantage (Ruiz-Ortega and García-Villaverde, 2008). This would be more important for e-businesses for several reasons. As sensing has both inward- and outward-looking aspects, it assists a firm to capture and control the right internal and inter-organisational information and effectively monitor the changing business environment in a timely manner (Daniel and Wilson, 2003). Sensing also has a dynamic and developmental nature, as it constantly explores, integrates and analyses information and knowledge to provide decision makers with real time information for timely and effective decisions. Likewise, as information and knowledge are the core elements of this dynamic capability (Wang and Ahmed, 2007), it may not be easily imitable and substitutable by competitors. It is therefore a valuable and unique capability in any firm for achieving competitive advantage (Galbreath, 2005). Given that the density of information (i.e. the rate of change and uncertainty) in an electronic marketplace of telecommunications is more remarkable than in traditional areas (Chang et al., 2003), sensing capability may have not been a strategic capability for traditional types of businesses in the past. However, our study shows that sensing capability is crucial in the current knowledge era. Therefore, the emphasis of our study on the fit between sensing capability and product-service strategy from a collective contingency perspective echoes the current call by the strategic and marketing

management scholars for further research on the fit between the external positioning of strategy and a firm's internal determinants (e.g. Yarbrough et al., 2011).

Our findings suggest that a firm's external environment strengthens the positive impact of product-service strategy-sensing capability fit on novelty. In this respect, our study makes a contribution through employing and examining several contextual factors in the current prevalent digital business environment. Much of the prior research (Joshi et al., 2003; Cao et al., 2011) has viewed strategic fit as a universal research phenomenon. Our study contributes insights into the non-universalistic nature of strategic fit and advocates a contingency approach to examine the moderating impact of two contextual determinants of technological and market turbulence on the strategic fit between product-service strategy and sensing capability on novelty. The results indicate that technological turbulence fortifies the positive impact of product-service strategy-sensing capability fit on novelty.

6.2 Managerial Contributions

This study has important implications for managers who wish to develop and implement differentiation competitive strategy in their firms. The findings draw managers' attention to the significance of sensing capability in conjunction with competitive strategy development and implementation process. In fact, managers should not underestimate the paramount role of developing an appropriate product-service strategy. This is because it enables managers to make dynamic capabilities (e.g. sensing capabilities) more rent-generating sources and smooth out the firm's move towards creating novelty. Accordingly, if the adopted product-service strategy fails to assist a firm's dynamic capabilities in value creation, managers are advised to revisit and adopt a new strategy. As such, manager should appreciate the interplay between product-service strategy and sensing capability. This highlights the need for marinating a balance between a firm's investments in implementing product-service strategies and awareness of the significant role of the firm's dynamic capabilities. The results

of the current study exhibit that sensing capability provides requisite synergy to create novelty. Furthermore, managers need to utilise IT-related tools and e-business solutions to better manage their sensing capability and create innovative products/services in the dynamic and technology-driven context of telecommunications (Chakravarthy, 1997). By using the Internet, these tools and applications provide telecommunications firms with borderless connection and unlimited geographical coverage. This may in turn aid them to enhance their strategic flexibility and simplify their inter- and intra-firms transactions.

Our study also advances a framework for managers to apprehend the undeniable contribution of strategic fit to value creation in their e-businesses. The implication of this finding for the management is that they require to put into place effective mechanisms (e.g. employees' training, investing in IT infrastructure or other web-based systems) which could establish a strong fit between strategies and capabilities and consequently increase their chances to create superior novelty. In the current study, novelty has not been addressed through the degree of value created to customers only, but also to other participants too, i.e. suppliers, distributors, partners, etc. (See Appendix A: measures of novelty). Therefore, this study provides valuable practical insights to the managers of both B2C and B2B firms who are willing to yield value to their participants (both customers and other businesses). Effective management of digital marketplace requires managers to proactively reflect upon environmental opportunities and constraints through offering novel and customised products/services, processes and solutions to the needs and expectations of all participants.

The findings also reaffirm the importance of adopting a contingency perspective in examining the links between environmental determinants and strategic fit. The research findings equip managers and leaders to a higher level of understanding about the role of contextual factors in describing novelty in telecommunications firms. This current study endeavours to investigate how environmental turbulence may benefit or deter the interaction

of dynamic capability view and competitive positioning view to achieve supreme novelty. This contingency view requires managers to be flexible in order to capture technological and market changes in the environment and to achieve higher degree of novelty. This is because any overestimation or underestimation of the degree of novelty may result in inaccurate and poor decisions such as the level of investments in developing sensing capability and the degree of efforts in implementing product-service strategy. This is particularly crucial in the dynamic and constantly changing context of telecommunications (Chakravarthy, 1997). The rapid advancement of technology and its consequences for the customers' needs and requirements, pose a number of challenging opportunities and threats for the firms performing in this market. It is recommended that managers improve their sensing capability to keep the most touch with the environment and also have a scenario planning in advance to put them in right place on an as-needed basis. In sum, it is our hope that our findings will bring about some benefits to managers in terms of awareness of the contingency nature of decision making in an age of unpredictable and uncertain digital environment.

7. Conclusion, limitations and future research

Our research advocates a contingency approach to the study of novelty by (i) identifying the impact of the fit between product-service strategy and sensing capability on novelty, and (ii) examining the moderating effect of external factors on this relationship. We elaborate on the notion of fit between these constructs by proposing a research framework. Grounded in contingency theory, the basic assertion of our research framework is that the internal (i.e. strategies and dynamic capabilities) and external (i.e. environmental turbulence) environments in which a firm operates determine the extent to which the firm can create novelty. The stronger the fit between the internal and external factors, the higher the level of novelty creation. The present study therefore suggests the appropriateness of contingency

theory as a potentially powerful theoretical and analytical tool for understanding the impact of several contextual factors on the nature of novelty in firms. Overall, the results highlight the significance of the alignment of sensing capability with those of product-service strategy to create novelty.

One of the main limitations of this study is that the data on both independent and dependent variables were obtained from a single respondent from the participating firms. Although the bias linked to this limitation is a threat that the respondent may endeavour to exaggerate their firm's status (Song et al., 2008) and create spurious results, it has been largely used in several relevant studies (e.g. Gruber et al., 2010; Fink, 2011; Claver-Cortés et al., 2012; Zona et al., 2013). In this respect, we attempted to largely minimise the bias by collecting the required data from the firms' key informants (Phillips, 1981). Our database showed that the common method bias was not an issue due to the scale's internal consistency and that the self-report method was deemed appropriate. Likewise, the data were obtained from the UK telecommunications which in particular is known as a highly dynamic and turbulent context. Moreover, this market is highly regulated in the UK. Such characteristics may decrease the generalisability of the findings. Hence, a replication of current study in other countries could further improve the generalisability of the findings and minimise common method bias (Li and Wong, 2011). Employing a cross-sectional data collection method is also an issue that much survey research must acknowledge. The potential bias can be overcome through using the longitudinal method (Slater, 1995). Moreover, only two contextual factors of technological turbulence and market turbulence were considered in this study and that the potential moderating impact of other organisational factors was controlled. As a result, further research could empirically examine the influence of other moderating effects of contingency factors particularly those associated with the internal determinants (e.g. firm's size, age, time online, and business model). Finally, while all research variables were

operationalised by using pre-adopted measures from previous studies, future research might reassess the measures to further validate the findings. For example to assess time online, the number of years a firm has online presence was measured in this study, while this may not explain how extensive or innovative the online presence is.

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