

Investigating the supply chain agility – innovation link:

The role of organizational context

Abstract – Previous literature provides ample analyses of the antecedents of *supply chain agility*, but the organizational *context* has generally been neglected. Setting up the right organizational context is important for dynamic capabilities such as supply chain agility, especially in turbulent times. In this research, we study organizational context from two aspects as antecedents of supply chain agility, i.e., a firm's *performance orientation context* and its *social orientation context*. In addition, we investigate the so far overlooked effect of supply chain agility on *innovation* performance, as we believe that supply chain agility not only helps prevent and repair short-term damage but also spurs innovation in the long run. We also consider the moderating role of the organization's *complementarity* with its key suppliers in this relationship. We build our hypotheses based on the dynamic capabilities view and refer to the literature on organizational context, supply chain agility, and innovation. Structural equation modeling is applied to examine the proposed research hypotheses using time-lagged and multi-respondent survey data gathered from Pakistan's manufacturing sector.

Keywords: Supply chain agility, innovation, organizational context, social orientation, performance orientation, complementarity, dynamic capabilities.

1. INTRODUCTION

Modern business environments are characterized by turbulence, short product life cycles, diverse customer requirements, rapid technological advancements, and high demand and supply uncertainty (Braunscheidel & Suresh, 2009; Hoekstra & Leeflang, 2023; Zhu & Gao, 2021). Most notably, the COVID-19 pandemic as well as the ongoing Russian invasion of Ukraine have put immense pressure on organizations of all sizes to adapt their business models to rapidly evolving novel operations and supply chain contexts, e.g., through ad-hoc supply chains (Müller et al., 2023; Schleper et al., 2021; Srai et al., 2023). Rather than being a temporal change, this “need for speed” is expected to be a permanent feature of business environments in Europe and globally (Anker, 2021).

Supply chain agility (SCA) has emerged as a capability that successful firms employ to provide an optimal response to such market conditions and hedge against supply chain disruptions in general (Braunscheidel & Suresh, 2009; Chowdhury et al., 2021). The SCA refers to the conditions under which and how well organizations and supply chains respond to customer needs in unstable, ambiguous, and complex environments in addition to shifts in supply and demand (Jadoul et al., 2020). Consequently, developing SCA has become a necessity in modern supply chains and provides an important area of research (Alfalla-Luque et al., 2023).

So far, a considerable body of knowledge investigates the antecedents of SCA, such as supply chain integration (Braunscheidel & Suresh, 2009), strategic orientation (Zhu & Gao, 2021), supply chain flexibility (Chiang et al., 2012), internal and external process connectivity (Roscoe et al., 2020), behavioral elements (Gligor & Holcomb, 2012), social capital (Zhang et al., 2023), or market sensing (Aslam et al., 2018). Hitherto, however, the role of organizational context, defined as “systems, processes, and beliefs that shape individual-level behaviors in an organization”

(Gibson & Birkinshaw, 2004, p. 212) has been overlooked as a potentially important antecedent of SCA.

Previous studies have shown that the consideration of organizational context is imperative in understanding the capability development process (Parmigiani & Howard-Grenville, 2011; Pentland et al., 2012; Winter, 2012). Given the role organizational context has played in previous research (Ghoshal & Bartlett, 1994; Gibson & Birkinshaw, 2004), we take this as an occasion for a more detailed investigation of its link to SCA. More precisely, we consider organizational context as composed of two strategic orientations: the performance orientation context and the social orientation context. Previous research has highlighted the importance of evaluating the impact of different types of strategic orientations on SCA (e.g., Zhu & Gao, 2021) and studies have shown that shaping organizational context is the prime contribution of a firm's top management (e.g., Hu et al., 2012). The context-action relationship is at the heart of firms' management processes (Ghoshal & Bartlett, 1994), which makes organizational context likely a key contributor to the development of firms' routines that comprise SCA.

While previous research has focused on capabilities and practices that enable SCA, we argue that organizational context matters in the successful development and deployment of SCA. Particularly in the modern unpredictable world, an organization's top management may not be able to identify the right activities but can provide the right organizational context in which the *right* routines can emerge, that become the building blocks of SCA. This element is overlooked in supply chain research. Building on these arguments, we suggest that SCA is developed when firms' top management provides a suitable context to nurture it (Ghoshal & Bartlett, 1994; Gibson & Birkinshaw, 2004). According to this perspective, superior performance is not only based on firms'

superior form of leadership, formal organizational structure, or strong culture. It is also built upon carefully contrived processes that shape firms' SCA (Gibson & Birkinshaw, 2004).

The effect of SCA on firms' operational and financial performance has been studied extensively (Alfalla-Luque et al., 2023), however, it is not known whether SCA also fosters firms' innovation performance. For instance, Swafford et al. (2006) find that SCA impacts a firm's ability to produce and deliver innovative products to its customers in a timely and cost-effective manner, Najar (2022) finds no positive effect of SCA on innovation performance. Besides, prior research has emphasized that to encounter market instability, firms should invest in SCA on the premise that it offers a sizable opportunity to innovate (Ketchen Jr & Craighead, 2021). Traditionally though, SCA is portrayed as a capability that helps repairing operational damage whereas supply chain adaptability is conceived as a capability that impacts adjustments to new markets (Aslam et al., 2018; Gunasekaran et al., 2017). In this study, we investigate whether SCA – despite its operational focus – serves as a capability that leads to better innovation performance as it allows firms to adjust innovations to seize emergent opportunities (Cai et al., 2019). We therefore believe that we can identify further effects of SCA that have been overlooked in extant research that particularly matter for the long-term survival of firms, which is particularly influenced by the organizational context (Teece et al., 2016).

Finally, as we only focused on the internal organizational context as an antecedent for SCA, we complement our internal view with an external view to understand under which conditions SCA might materialize in innovation for the focal firm. Prior studies have shown that the complementarity of supply partners is a key driver for performance (Cheung et al., 2010; Liao & Li, 2019; Ndubisi et al., 2020), thus we further include an external factor that helps us to better

understand the interplay of internal and external contextual factors. Specifically, we seek to answer the following research questions:

RQ1: What is the impact of organizational context on SCA?

RQ2: What effect does SCA have on the relationship between organizational context and innovation performance?

RQ3: How does complementarity between the focal firm and its key suppliers *modify* the SCA – innovation relationship?

To answer these questions, we develop a research model and test it based on a time-lagged, multi-respondent sample data of 220 firms from Pakistan's manufacturing sector. We believe that an investigation in a developing country like Pakistan is particularly valuable due to the higher level of uncertainty present in emerging markets. To derive our hypotheses and substantiate our empirical findings, we draw from the literature on SCA, organizational context, as well as the dynamic capabilities view (DCV) (Teece et al., 1997).

This study's contributions are threefold: First, it shows that SCA does not only influence the short-term performance outcomes (i.e., financial, and operational performance), but also the long-term success perspective (i.e., innovation performance). Second, it emphasizes the need for the *right* context in which to flourish, particularly in dynamically changing environments, which has been overlooked in supply chain research to date. In doing so, our study also provides the context for developing dynamic capabilities. Finally, we emphasize that while management can directly influence the internal context, it must consider the external context, which can hinder the positive effects of the internal context.

The remainder of the article is structured as follows: The subsequent section introduces the theoretical background, derives our hypotheses, and presents the overall framework. Section three describes the applied methodology, including an overview of the data collection and data analysis

process. Thereafter, we present the results of the tested hypotheses and the structural equation model, followed by a discussion of the theoretical and practical implications of our findings. The study concludes with a summary of the key results, limitations of our study and pathways for future research.

2. THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1 Organizational Context

The modern world has become increasingly globalized. Rapid advancements in technology have allowed organizations to provide customized products, resulting in growing customer demand. This has steered firms towards successive cycles of restructuring and rationalization in the last few decades. Scholars have argued that reinventing business models may not be an appropriate response to changing environments. Instead organizations need to develop a context that can change employee behavior towards responses appropriate to the specific environment (Bartlett & Ghoshal, 1995). Organizational context has thus been identified as an important factor influencing managerial decisions (Úbeda-García et al., 2020).

Previous research has shown that context can both induce and impede behavior (Batistič et al., 2016; De Keyser et al., 2023). It is thus important to identify the right mix of contextual elements that can lead to the required response from the organization's members. Ghoshal and Bartlett (1994) argued that the purpose of organizational context is to provide organizational renewal under a dynamically changing environment. They suggested discipline, stretch, support and trust as key elements of organizational context. These contextual factors allow for self-renewal of the organization's resources, capabilities, processes and business model, and are formed and strengthened by macro and micro-level decisions of the top management (Ghoshal & Bartlett, 1994).

However, Gibson and Birkinshaw (2004) did not find empirical support for these four factors. Instead, two factors emerged: ‘performance management context’ incorporating discipline and stretch representing the hard aspects of organizational context which stimulate organizational members to perform at a high level and hold them accountable for their actions; and social context consisting of support and trust entailing those aspects which provide members with the security and autonomy required to perform well. Both contexts are crucial and mutually reinforcing. Together this *balanced* mix of hard (i.e., performance management context) and soft (i.e., social context) elements builds “the yin and yang of continuous self-renewal” (Bartlett & Ghoshal, 1997).

2.2 Organizational Context and SCA

A dynamic capability is the ability “to sense and then seize new opportunities and to reconfigure and protect knowledge assets, competencies, and complementary assets to achieve a sustained competitive advantage” (Augier & Teece, 2009, p. 412). Dynamic capabilities transform business processes and enable resource deployment, redeployment, and operations (Teece, 2007), and account for the difference in firms’ competitive positions with similar bundles of resource endowments (Scheuer & Thaler, 2022). Dynamic capabilities exist at both the firm and the supply chain level (Aslam et al., 2020; Teece, 2007). In this study, we consider SCA as a dynamic supply chain capability (Aslam et al., 2018; Eckstein et al., 2015) that allows firms to respond speedily to short-term changes in demand and supply patterns while improving product delivery efficiency (Zacharia et al., 2014; Zhu & Gao, 2021). SCA extends the boundaries of the firm to include customers and suppliers and thus helps firms seizing opportunities and neutralize threats in the marketplace (Blome et al., 2013; Eckstein et al., 2015).

It is a well-established in the dynamic capabilities literature that the evolution of dynamic capabilities is influenced by organizational context (Daronco et al., 2023; Teece et al., 1997).

Organizational context constitutes firm resources, size, and top management support (Zeng et al., 2020). A firm's top management develops the context in which dynamic capabilities (e.g., SCA) are developed. Anand et al. (2009) for example, investigate how a continuous improvement context contributes to the development of dynamic capabilities in a firm. Similarly, Strauss et al. (2017) show that the dynamic capabilities associated with organization's sustainability vary across contexts. Based on the case studies of critical transformation events, Paavola (2021) showed give distinct theoretical outcomes suggesting the interconnections between organizational context, organizations, and their dynamic capabilities.

Bartlett and Ghoshal (1995) postulate that the behavioral context provides an organization with elements that fulfill the never-ending need for renewal. Dynamic capabilities are developed by carefully crafting norms, systems, and processes that have bearing on a firm's performance management and social support context. This behavioral context allows the essential knowledge processes underlying these capabilities to thrive (Prieto et al., 2009). Burgelman (1983) argues that strategic behavior is preceded by strategy. Induced strategic behavior closely follows the corporate strategy, while autonomous strategic behavior falls outside the gambit of the existing strategy of the firm. Social support orientation encourages autonomous strategic behavior and performance orientation inspires induced strategic behavior (Burgelman, 1983). Both elements of organizational context, i.e., performance management and social support, affect SCA as they contribute to a *high-performance context* (Gibson & Birkinshaw, 2004). For example, performance management context aligns the organization's efforts and resources toward the accomplishment of its goals, objectives, and desired outcomes. This typically involves optimizing internal processes, enhancing employee productivity, and adapting to changes in the business environment to maintain or improve performance metrics (Calza et al., 2010). We assume that firms with a strong

performance management context understand that SCA is instrumental in achieving and sustaining high levels of overall organizational performance. This connection involves optimizing supply chain processes to be responsive, adaptable, and capable of rapid adjustments in the face of evolving market conditions. Regarding the social context of a firm, we argue that firms that develop and empower their staff and that decentralize information access present an investment in people, rapid change activities, and knowledge management which have been found to lead to higher agility (Fayezi et al., 2017).

Based on the above arguments, we propose the following:

H1: *The performance management context of a firm has a positive impact on SCA.*

H2: *The social context of a firm has a positive impact on SCA.*

2.3 SCA and Innovation Performance

In general, SCA is assumed to have a positive impact on competitiveness and profitability through different firm performance dimensions (Aslam et al., 2018; Dubey et al., 2018). Prior research found positive effects of SCA on operational, marketing, financial, and cycle time performance (Blome et al., 2013). However, in their literature review Al Humdan et al. (2020, p. 303), find “a complex relationship between SCA and different types of performance” as direct results have been ambivalent. Some studies only found indirect links through mediating variables (e.g. Gligor et al., 2015). In this study, we evaluate if, contrary to the current wisdom that SCA improves organizational performance in the present, it actually improves future performance by allowing firms to improve their innovation performance (Aslam et al., 2018). So far, there is mixed evidence of this link with some studies postulating a positive relationship (e.g., Swafford et al., 2006), and others finding no positive effect of SCA on innovation performance.

Innovation performance describes a firm's capability to enhance the usefulness or performance of its products and services and is commonly acknowledged as a driver of competitive advantage due to its potential for revenue growth – not only at the firm but also at the supply chain level (Cheng et al., 2014; Oke et al., 2013; Wei et al., 2020). Innovation performance is generally considered a key factor within an economy's manufacturing sector as it is particularly those firms that significantly drive innovation and through which economies in turn realize economic development and growth (Wei et al., 2020).

Prior studies proposed that SCA is a capability that helps tackle the market risk in a better way (Braunscheidel and Suresh, 2009), i.e., through the avoidance of operational damage. The literature on innovation suggests that innovative firms differ from less innovative ones based on their risk propensity, ability to handle uncertainty and new technology acceptance (Hurley & Hult, 1998; Ravichandran, 2018). Furthermore, SCA has been referred to as a firm's capability to respond to market changes in the short term, which implies some form of time pressure. Time pressure in turn has been found as an antecedent of innovation for two reasons (Wu et al., 2014): Firstly, it inspires organizational members to accomplish their tasks on time often by deviating from routines (Ohly & Fritz, 2010) and it signals “a suboptimal condition that requires more effort to achieve the expected goal” and, thus results in individuals' trying new approaches and ideas (Fay & Sonnentag, 2002; Wu et al., 2014, p. 1516). Secondly, time pressure forces individuals toward quick information processing (Mann & Tan, 1993). As a result, such members develop capabilities for knowledge combination and knowledge processing (Wu et al., 2014), which results in a better collective response and innovative solutions.

In this study, we assume SCA to be a capability that positively influences a firm's innovation performance. Prior research suggests that innovation is embedded in a firm in such a way that it is

affected by external (i.e., supply chain-wide) factors and that it emerges from the recombination of resources internal and external to the firm (Guan et al., 2015). While most firms can produce standardized products and services, firms with high levels of SCA are more capable of recognizing the importance of creative solutions and building management systems that support both creativity and efficiency, which lead to higher levels of innovation performance (Winby & Worley, 2014). Furthermore, SCA allows an organization to adapt rapidly to evolving market conditions, customer preferences, and technological advancements, creating an environment conducive to innovation and it requires organizational members to indulge in frequent experimentation and problem solving which may lead to more creativity and innovation (Najar, 2022; Um et al., 2017). Therefore, we postulate:

H3: *SCA has a positive impact on innovation performance.*

2.4 Organizational Context and Innovation Performance: The Role of SCA

It would be misleading to expect that the elements of organizational context (i.e., the performance context and social context of a firm) result in superior innovation performance. Instead, they shape routines that lead to SCA resulting in superior innovation performance (Gibson & Birkinshaw, 2004). The social support context reflects the managerial practices used to provide support to employees (e.g., freedom of initiative at lower tiers, assistance from middle management to operational employees, etc.) and build a climate of trust. The performance management context reflects the management practices encouraging employees to achieve higher performance levels and making them responsible for their success (Úbeda-García et al., 2018; 2020; Schnellbacher et al., 2019). In this way, organizational context shapes the way managers give meaning to opportunities and threats in their environment (Sharma, 2000). It allows managers to interpret the patterns of change, and influences these by affecting how issues are interpreted (Dutton &

Dukerich, 1991). It follows that organizational context affects the way environmental stimuli are *sensed* and how organizations *respond* (i.e., through SCA) to the sensed stimulus. Consequently, organizational context (i.e., the performance context and social context of a firm) affects innovation performance through the development of SCA capability. We, thus hypothesize that SCA mediates the relationship between organizational context and innovation performance since SCA is considered a dynamic capability developed over time through the interaction of various elements of organizational context (i.e., stretch, discipline, support, and trust). We therefore propose:

H4: *SCA mediates the relationship between the performance management context and innovation performance.*

H5: *SCA mediates the relationship between the social context and innovation performance.*

2.5 The Moderating Role of Complementarity

Complementarity is the degree to which supply chain partners possess distinctive assets that are valuable in an exchange relationship (Cheung et al., 2010). Complementarity in an exchange relationship allows buyers to get specialized resources and capabilities through their suppliers that they otherwise may not have been able to access (Ndubisi et al., 2020). Researchers have noted that resource complementarity is one of the key reasons to enter into an alliance and it is only valuable if the value of resources is greater *after* pooling (Chung et al., 2000). From the perspective of dynamic capabilities, complementary in buyer – supplier relationships has a profound impact on capability formation and use. It is the mechanism used by firms to leverage superior performance through the use of resources existing at various links of the supply chain (Song et al., 2005). Prior research in the area of dynamic capabilities has shown that complementarity between

the supply chain partners helps in building ‘core competencies’, other dynamic capabilities (Rodrigo-Alarcón et al., 2018; Ruiz-Ortega et al., 2023), and innovation (Sáenz et al., 2014). It helps in fixing afflicted routines and weak links in firms strategy (Teece et al., 1997).

Considerable empirical research has studied the effect of complementarity between supply chain partners on innovation (e.g., Khraishi et al., 2020; Ndubisi et al., 2020). In our study, we explore the contingency role played by buyer-supplier complementarity in the relationship between SCA and innovation performance. We assert that higher levels of complementarity will strengthen the SCA-innovation relationship. SCA entails quick information flow and its utilization throughout the supply chain to seize market opportunities by improving on current offerings (i.e., products and services) and developing new ones. (Lee, 2004; Whitten et al., 2012) Complementarity with suppliers adds value through the availability of suppliers’ idiosyncratic resources and capabilities for the betterment of the buyer-supplier relationship (Khraishi et al., 2020). Hence, the synergies achieved through the buyer-supplier complementarity will positively influence the SCA-innovation performance relationship. Consequently, we propose:

H6: *Complementarity with suppliers moderates the relationship between SCA and innovation performance in a way that high levels of complementarity are related to higher levels of innovation performance.*

-----Insert Figure 1 Approximately Here-----

3. METHODOLOGY

The purpose of this study is theory testing, which is why a survey method was deemed appropriate (Krause et al., 2018). The survey research design also allows uncovering the effects of more fine-grained variables than secondary data could offer (Roth & Rosenzweig, 2020). The data were

collected in Pakistan's manufacturing sector with the firm as the unit of analysis. We used an *embedded* design where an organization is considered intertwined in a network of relationships (Schoenherr & Swink, 2012). Although the development of SCA was of key interest in this study, the focus on the firm-level helped delineate the effects of antecedents for the firm not confounded by aggregation of strategies throughout the supply chain (Saraf et al., 2007).

Pakistan's manufacturing sector was chosen as it provides an interesting developing country context for this study. The country is passing through a turbulent period of social change and intermittent economic growth and crises (World Bank, 2017), driving the need for SCA as well as innovation performance. Pakistani businesses face strong international competition with the development of the China Pakistan Economic Corridor (CPEC). Recent news reports have argued that based on the changing geopolitical conditions, Pakistan has the potential to become critical raw material supplier for EU and other western countries (Dawn, 2023). The current raw material trade of the country with Europe stands at over half a billion dollar with a tremendous growth potential (World Bank, 2021). We therefore believe that the empirical context allows us to observe more variance in more established markets that add to theory testing, although the research model as such would be interesting to study in a more mature market as well.

3.1 Data Collection

We collected survey responses from managers working in operations and supply chain-related functions in Pakistan's manufacturing industry. Previous studies have highlighted concerns about data collection in developing countries (e.g., Aslam et al., 2020; Malik & Kotabe, 2009). For example, although the population of studies is easy to determine in general, institutional restrictions in terms of available address databases require different sampling approaches than mature markets offer. Our study faced similar problems, and we therefore developed a sample of

the Pakistani manufacturing sector via LinkedIn contacts. LinkedIn is the largest professional networking site with over 850 million users (LinkedIn.com, 2023) which is also rapidly growing in Pakistan (Farooq, 2019). Furthermore, the platform has been used for empirical inquiry in a range of operations and supply chain-related research projects in the past (Aslam et al., 2022; Blome et al., 2014; Kalaitzi et al., 2019).

In total, we were able to identify 1,783 operations and supply chain professionals showing affiliations with Pakistan's manufacturing industry (each from different firms). We sent these managers emails detailing the objectives of our study and requesting their consent to participate. As a result, we received favorable responses from about 800 professionals. Thereafter, emails containing the link to the online survey were sent to the consenting participants. The study design also foresaw the collection of two independent responses per organization, wherever possible, to deal with common method variance concerns. Our final data contained responses from 347 managers, which accounts for a response rate of 43% in relation to 800 professionals showing interest and 20% of the total population. We tested for a non-response bias using the method proposed by Armstrong and Overton (1977). This method compares early and late respondents while considering the late respondents as a proxy for non-respondents. We made the comparisons based on organization size (i.e., sales and number of employees) and employee experience using independent sample *t*-tests. Our results indicated no significant differences between the early and late respondents for all three variables ($p > 0.05$), indicating that we do not have a relevant non-response bias within our study.

Out of the 347 responses, 126 responses are pairs with the second response received an average of four weeks after the first response. These responses were combined, such that the independent variables (i.e., social orientation and performance orientation) and the intermediate

variable (i.e., SCA) were measured at time T_1 while the dependent variable (i.e., innovation performance) was measured at time T_2 by two independent assessors. For the remaining 95 responses, we only used the measurement from a single respondent. One response had to be discarded due to a high number of missing values. The final data set contains 220 responses. Table I and Table II provide the profile of responding organizations and their respondents.

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3.2 Measures

We use existing validated scales to measure the constructs of this study. To identify the relevant scales, an in-depth literature review was conducted to choose scales with suitable psychometric properties. We used perceptual measures to elicit responses from the target respondents since the variables of interest in the study could not be approximated from the secondary data available in the annual reports of firms. In the following section, we provide the details of the scales used in this study. All measurement items used a seven-point Likert scale, with 1 representing ‘strongly disagree’ and 7 representing ‘strongly agree’.

1) *Organizational context*: We adopted the elements of organizational context from the study of Gibson and Birkinshaw (2004). Gibson and Birkinshaw adopt the conceptualization of Ghoshal and Bartlett (1994) as consisting of discipline, stretch, support and trust. Based on empirical analysis, Gibson and Birkinshaw (2004) classify discipline and stretch as *performance management context*, measuring the degree to which organizational context – through management systems in supply chain function – sets challenging performance targets, issues creative challenges, focuses people toward task orientation and stretches its members to achieve higher

performance. Support and trust are classified as *social context*, assessing how the context supports – through management systems in supply chain function – and processes by devoting considerable effort to developing subordinates of management staff, providing empowerment, giving information access and base decisions on facts, etc. These scales are adapted to represent the supply chain function of the responding firms.

2) *Supply chain agility*: We adapt the scale for SCA from Whitten et al. (2012)'s study who base their scale on the operationalization of Lee's triple-A supply chain concept (Lee, 2004). The scale measures the degree to which the organization promotes information flow with suppliers and customers, develops collaborative supplier relationships, makes contingency plans, etc. The scale has been employed in several previous studies including Dubey et al. (2018), Aslam et al. (2020), and Fosso Wamba and Akter (2019). The scale captures the ability to respond to disruptions and provide shorter response times through the "swift information sharing" between the supply chain partners, building contingency plans and forming crises management teams, and collaborative relationships with suppliers that lead to quick response from the upstream partners (Lee, 2004; Whitten et al., 2012).

3) *Organizational complementarity*: The organizational complementarity scale measures the degree to which the resources brought to the relationship by the supply chain partners are valuable and significant in getting the job done. For this purpose, respondents were requested to consider their major supplier in terms of purchase volume and value. It measures the degree to which the combined abilities of the firm and its major supplier enable them to achieve goals that are out of reach for the individual firm (Cheung et al. (2010). This scale is in line with the previous studies measuring the resource complementarity between the alliance partners (e.g., Sarkar et al., 2001).

4) *Innovation performance*: Innovation performance measures the degree to which, compared to its competitors, focal firms: better and more effectively develop new products, introduced innovations and increased revenues from these innovations in the last three years, and quickly converted the concept of innovation into market place introduction (Oke, 2013). Oke (2013) bases his scale on Cordero (1990) as well as Scott and Bruce (1994).

3.3 Common Method Bias

We undertook several pre-emptive procedures to overcome the problem of common method bias (CMB) in this research and followed several guidelines in this respect (Conway & Lance, 2010; MacKenzie & Podsakoff, 2012; Podsakoff et al., 2003). The most important step taken to overcome the CMB was to make a significant effort to receive two responses from each organization separated by an average time lag of about a month. Ketokivi and Schroeder (2004) suggest that multiple respondents are a key measure to mitigate the CMB. In our data collection effort, we were able to achieve two responses from more than 50 % of the responding organizations (i.e., 126 out of 220).

As we had not achieved time-lagged multiple responses from all the sample organizations, we applied statistical procedures to detect the possibility of a CMB. We used a theoretically unrelated marker variable to assess the CMB (Whitney et al., 2001). Supply chain disruption (Wagner & Bode, 2006) was chosen for this purpose. The variable showed good psychometric properties with the composite reliability (CR) of 0.78 and average variance extracted (AVE) of 0.54. We applied its correlation with all other model variables. The highest bi-variate correlation was with innovation ($r = 0.15, p < 0.05$). All other bi-variate correlations were insignificant. Based on this we concluded that a CMB was not a problem in our research.

4. RESULTS

4.1 Measurement Model Validation

We used confirmatory factor analysis (CFA) to validate the measurement model. The model fit indices ($\chi^2 = 1.37, p < 0.01$; CFI = 0.97; SRMR = 0.06; RMSEA = 0.041) showed a good model fit (Hu & Bentler, 1999). The factor loadings for all constructs averaged at about 0.7, and the AVE values were greater than 0.5 (Fornell & Larcker, 1981). In conjunction with the significant p -values for all items, this indicated adequate convergent validity.

To assess the discriminant validity, we compared the square-root of AVE for each variable with its bi-variate correlations with all other variables. In each scenario, the square-root of AVE was greater than the associated correlations, providing evidence for discriminant validity (Fornell & Larcker, 1981). CR was used to estimate the internal consistency reliability of the constructs. All constructs showed suitable levels of reliability with CR coefficients higher than 0.8. Table III provides the standardized loadings, AVE, and CR for all constructs. Table IV shows the comparisons between the correlations and the square-root of AVEs. Table IV also provides the means and standard deviations (SD) for the constructs of this study.

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4.2 Structural Model Evaluation

Before testing the structural model, we tested assumptions of multivariate tests. Mahalanobis distances were used to estimate multivariate outliers. Based on the chi-squared test, only one significant outlier was observed in the data set. We did not consider it influential in the analysis and kept it in the data set. We tested the univariate normality through the coefficients of skewness

and kurtosis while the multivariate normality and homoscedasticity were tested through the residual plots by predicted values. The highest values of skewness and kurtosis coefficients (-0.94 and 1.37 respectively) were well within acceptable limits (Curran et al., 1996). Furthermore, residual plots did not raise any cause for concern regarding multivariate normality or homoscedasticity. The scatter plots between endogenous and exogenous constructs provided strong indication of linear relationship, hence the linearity assumption was also met. Finally, we tested multicollinearity through the assessment of variance inflation factors (VIFs). All factors were below three, well below the threshold of 10. Hence, we concluded multicollinearity was not a problem (Hair et al., 2014).

The results of the structural model are provided in Table V. **H1** and **H2** postulated a direct effect of social and performance management context on innovation performance. The results show that both performance management context ($\beta = 0.30$; $p < 0.10$) and social context ($\beta = 0.51$; $p < 0.01$) have a significant positive impact on innovation performance. Hence, hypotheses **H1** and **H2** are supported. However, the relationship is much weaker for performance management context than for the social context. Our **H3** claimed a positive relationship between SCA and innovation performance. The results of the study confirm this relationship ($\beta = 0.36$; $p < 0.01$). Hence, **H3** is supported, too. Hypotheses **H4** and **H5** postulated an indirect effect of social and performance management context on innovation performance through SCA. We used bootstrapping procedures (Hayes, 2018) with 5,000 bootstrap samples and 90% confidence intervals to test the indirect effect significance. Our results show that performance management context has a weak but significant impact on innovation performance through SCA ($\beta = 0.11$; $p < 0.10$; lower confidence limit = 0.009; upper confidence limit = 0.270). Social context on the other hand has a strong indirect influence on innovation performance through the mediating role of SCA

($\beta = 0.19$; $p < 0.05$; lower confidence limit = 0.042; upper confidence limit = 0.404). Hence hypotheses **H4** and **H5** are supported, which leads to the conclusion that SCA positively mediates the relationship between social/performance management context and innovation performance. Finally, hypothesis **H6** suggested a positive moderation effect of complementarity between the effect of SCA and innovation performance. Our findings indicate that, although significant, the relationship between these has an opposite direction ($\beta = 0.13$, $p < 0.05$), i.e., complementarity has a negative influence on the relationship between SCA and innovation performance. Hence, hypothesis **H6** is not supported.

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5. DISCUSSION

In this study we developed a hypothesized model to assess the relationship between elements of organizational context, SCA, and innovation performance. We also investigated the potential moderating effect of organizations' complementarity with their leading suppliers and postulated that SCA will mediate the effects of organizational context on innovation performance. By testing these hypotheses and our model with data from supply chain managers in the Pakistani manufacturing industry, we found overall support for the role of organizational context in influencing SCA and innovation performance.

Addressing SCA on the firm level, our results highlight that SCA is essential for firms to perform well in the face of complex and uncertain business environments (Blome et al., 2013; Braunscheidel & Suresh, 2009; Müller et al., 2023) by contributing to their enhanced ability to innovate. The results thus extend earlier findings assessing the effects of SCA on various performance outcomes (Alfalla-Luque et al., 2023) by investigating the SCA-innovation relationship.

A further interesting finding in this study relates to the moderating role of complementarity with suppliers. Our results counterintuitively show that complementarity negatively moderates the relationship of SCA and innovative performance (Figure 2). This finding adds to the emerging discourse about the role of complementarity and close ties between firms and their suppliers. One stream of literature posits that collaborations and complementarities with suppliers provide collaborative advantage (Dyer & Nobeoka, 2000) and generates value that enhances the innovation propensity of both partners (Andersson et al., 2002; Ndubisi et al., 2020). This argument is based on the fact that capitalizing on each other's distinctive resources and competencies provides opportunities for supply chain partners to achieve process and product innovations (Cheung et al., 2010). Villena et al. (2011) propose that such embedded relations with suppliers are subject to diminishing returns where they provide positive results up to a certain threshold, after which they become negative and limit learning as well the innovation propensity of the organization. Thus a second stream of literature has formed suggesting that collaborations could invoke partner opportunism, spill-over of knowledge to competitors, loss of objectivity and even redundancy of knowledge (Noordhoff et al., 2011; Villena et al., 2011). Our results support this second line of inquiry because it shows that prevalence of complementarity with suppliers has a negative impact on the relationship between SCA and the firm's innovative performance.

Furthermore, we find that SCA mediates the relationship between organizational context and innovation performance. Both performance management context and social support context influence innovation performance through SCA. These findings extend the work of Gibson and Birkinshaw (2004) and Úbeda-García et al. (2020) who show that organizational context positively influences organizational performance through intermediate outcomes. Our findings substantiate these studies by showing a positive effect of social and performance contexts on innovation

performance through SCA. However, our results differ from these studies as they investigate the combined effects of organizational context, whereas we also estimate the differential effect of performance management context and social support context on innovative performance. We find that social support context has a more salient relationship compared to performance management context. It leads to the conclusion that people focused management practices in organizations are more likely to develop agile practices and lead to superior performance outcomes. This is in line with prior research showing that trust and support (i.e., social context) are linked with firms' innovation propensity. Innovation demands creativity and risk-taking behavior that requires supporting organizational environment (Naldi et al., 2007).

5.1 Theoretical Implications

Our research contributes to the discourses around dynamic capabilities in general and SCA in particular in the following four ways. First, previous research has shown that dynamic capabilities enable firms to successfully compete in modern unpredictable business environments (Aslam et al., 2018; Helfat & Winter, 2011). In addition, several studies have evaluated the importance of SCA – a firm level dynamic capability – for firm performance. Yet, previous studies have not been able to identify the context in which SCA is nurtured. A major contribution of this study is to explain the context in which SCA capability can be developed.

Second, another important implication of this study is to highlight the role of context in organizations' ability to develop and exploit dynamic capabilities. We find that both performance management and social context foster the development of SCA. Previous literature on organization theory suggests that development, configuration, and exploitation of resources, competencies, processes, and routines require a supporting context. In other words, even if different resources are available that could lead towards the development of a specific dynamic capability, a supportive

organizational context – that includes systems, beliefs, and practices that influence the individual behavior – would be needed (Ghoshal & Bartlett, 1994; Gibson & Birkinshaw, 2004).

Given the importance of context, it is interesting to note that in studying antecedents of SCA and other dynamic capabilities, the focus of research on the *context* as preliminary and essential requirement for dynamic capabilities remains underemphasized. Our study also provides credence to the framework presented by Collis (1994), which suggested the existence of dynamic capabilities at various levels. Our research confirms SCA as a first-order dynamic capability that directly influences the performance outcomes (Aslam et al., 2018; Aslam et al., 2023; Teece, 2014)

Third, it is worth noting that different types of dynamic capabilities might have different antecedents and outcomes. For example, Aslam et al. (2020) find that entrepreneurial orientation and supply chain learning orientation antecede supply chain dynamic capabilities, while Wu and Nguyen (2019) highlight that knowledge resources and relationship based assets lead to dynamic service innovation capabilities. Therefore, contrary to some attempts of identifying antecedents of dynamic capabilities as a general construct (e.g. Bitencourt et al., 2020), it is useful to identify antecedents of different dynamic capabilities. Accordingly, our study identifies new antecedents (i.e., performance management and social support) and outcomes (i.e., innovative performance) of SCA.

Finally, our results indicate that complementarity between organizations and their suppliers negatively moderates the relationship between SCA and innovative performance. This unexpected finding highlights the importance of external context for dynamic capabilities to yield positive results. We thus suggest that even if there is complementarity between firms and their suppliers, other contextual factors like opportunism and knowledge spillovers to competitors could prove to

be detrimental for innovation outcomes of dynamic capabilities. In other words, for complementarity to yield positive results other supportive factors must be present in the context.

5.2 Managerial implications

In today's exceedingly competitive and uncertain business environment, continuous adaptation and offering innovative solutions to customers have become essential for organizational success and survival. Managers must make effective decisions to enable and foster environments that allow their employees to sense environmental changes and actively adapt to these changes. The well-known clothing brand Zara is a prime example of achieving supply chain agility. Thanks to its capability of sensing the shifts in fashion trends and realigning its processes and capabilities Zara has successfully developed an agile overseas and in-house network that enables it to manage its diverse product market in a two weeks' time to serve cycle (Lyons et al., 2012). Among other factors, this agility stems from the effective integration of its cross functional teams of fashion specialist – who are expert in sensing the pulse on the street, commercial specialists – who assess financial viability of products, and production experts who manage inventory, production, and logistical operations (Aftab et al., 2018).

The findings of this study suggest that innovative performance is an inter-organizational phenomenon which hinges on the organizational context in the face of dynamic environments. In other words, managers must appreciate that innovative performance requires the ability to sense forthcoming environmental changes and to adapt across supply chains. Our results emphasize that SCA is directly linked to an organization's innovative performance. This is the case mainly because organizations are interdependent in terms of the resource acquisition necessary for their functioning, and any change in processes, routines, technology, or strategy of an organization would require support from and alignment with other value chain partners.

Furthermore, the study shows that the development of dynamic capabilities like SCA owe a great deal to the context of the organization. Although both the performance and social context are important for the development of dynamic capabilities and in turn innovative performance, managers need to pay more attention to the social support context. SCA and innovation require an organizational setting characterized by trust and organizational support. This provides psychological safety and motivation for employees in being vigilant to changing environments and fosters adaptation and reconfiguration of their collaboration with supply chain partners. Moreover, we suggest that managers must be vigilant that complementarity with suppliers may not necessarily yield positive outcomes for SCA and innovative performance relationship. Although the data do not explicitly show the reason, interpreting our findings in view of the literature on buyer-suppliers relationship provides indication to the managers that various factors like opportunism, pilferage of knowledge and complacency may even cause negative effect of complementarity between organizations and their suppliers.

5.3 Limitations and Future Research

Interpretation and generalization of the findings of our research should be made in the purview of the limitations of the study. First, self-reported measures have been used to collect the data mainly because objective data on innovative performance and other variables was not accessible in the study settings. Second, to mitigate the concerns of common method variance, we envisaged collecting two responses per organization, however succeeded only with 126 paired responses and 95 single responses. To enhance the methodological rigor in future studies, we therefore suggest using objective measures, probability sampling, and the collection of multiple responses from organizations.

Third, our study found an unexpected negative moderating effect of complementarity on the relationship between SCA and innovative performance. Although prior literature provides some explanation for this apparently inverse finding, our data do not show how complementarity turns this link into the opposite direction. We thus call for further research to investigate under what conditions and how complementarity could hamper the relationship between SCA and innovative performance. Moreover, we only studied complementarity between an organization and its supplier, which invites researchers to study SCA in relation to other supply chain actors, too.

The data for this study was collected in 2020, before the onset of the global pandemic. During the pandemic, substantial shifts occurred in the demand, sourcing, production, and logistical patterns of organizations, prompting a comprehensive redesign of supply chains. This period underscored the critical imperative for agility in supply chains within a disrupted world (Saarinen et al., 2020). This could have affected some of our results. However, it needs to be noted that there is a consensus that post-pandemic supply chains will undergo profound transformation compared to their pre-pandemic state. This transformation is driven by factors such as increased surveillance and collaboration, widespread subcontracting, improved demand forecasting capabilities facilitated by advanced tools like machine learning and artificial intelligence, the emergence of micro supply chains, and adjustments in last-mile delivery channels (Panwar et al., 2022). Consequently, the evolution of the supply chain is ongoing, demanding an increased focus on dynamic capabilities such as SCA (Frederico, 2021).

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Figures and Tables

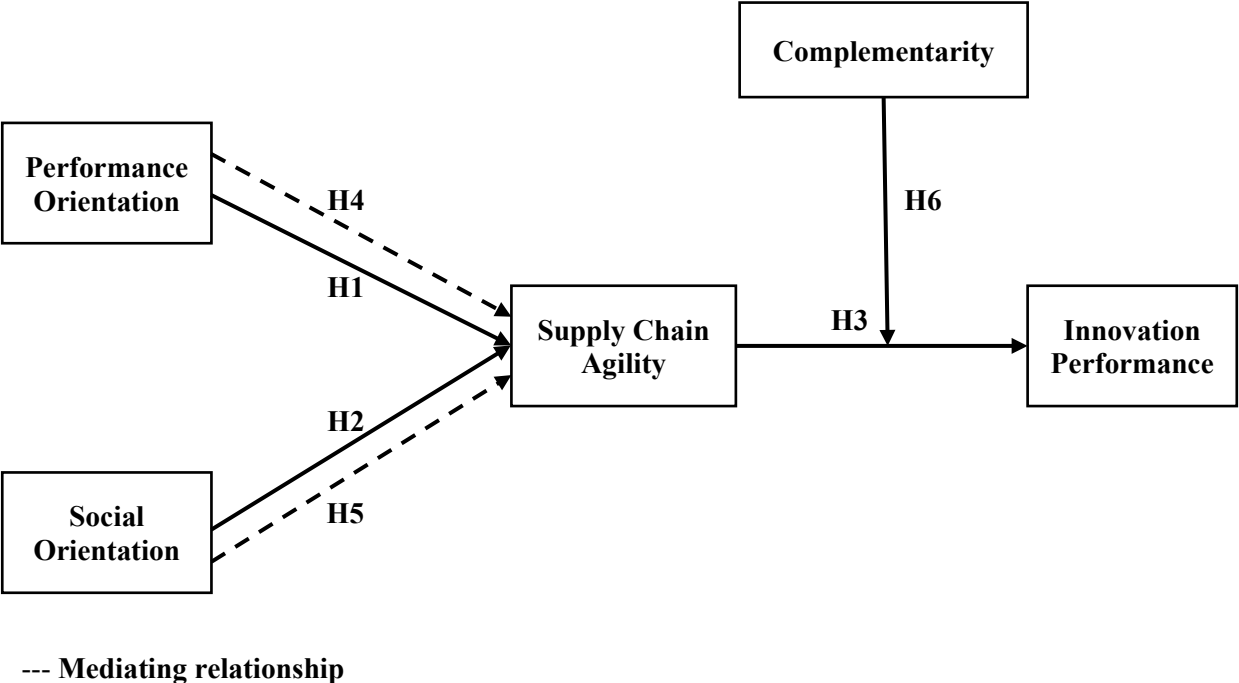


Figure 1: Hypothesized model.

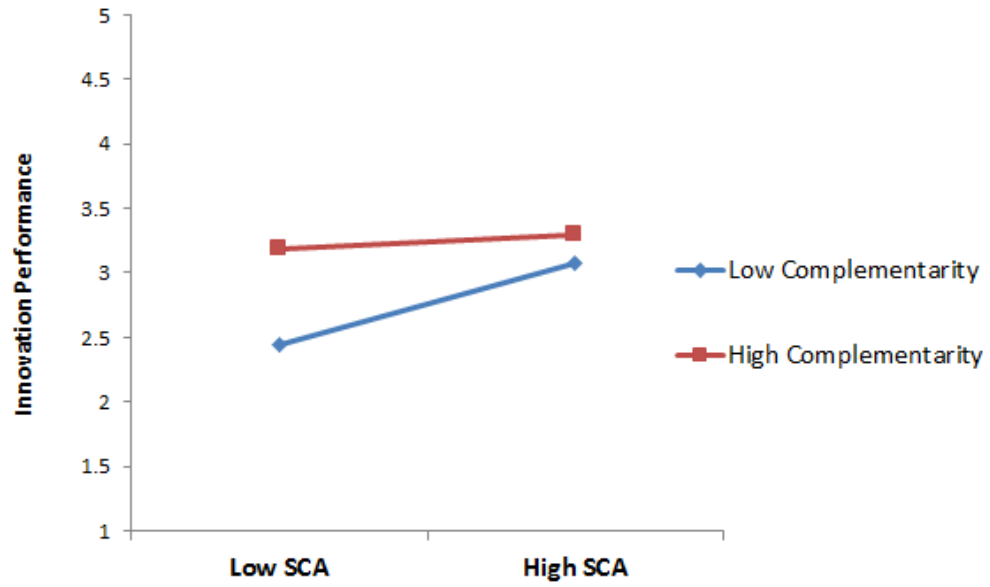


Figure 2: Interaction plot.

	Frequency	(%)
<i>Industry</i>		
Textile & apparel	44	20.0
FMCG	29	13.2
Chemicals	19	8.6
Electronics	18	8.2
Pharmaceutical	15	6.8
Paper & packaging	14	6.4
Energy	13	5.9
Engineering	11	5.0
Construction	7	3.2
Miscellaneous	30	13.6
Not provided	12	5.5
<i>Organization history</i>		
< 5 years	28	12.7
5 - 10 years	21	9.5
11 - 20 years	49	22.3
> 20 years	88	40.0
Not provided	34	13.6
<i>Sales (in Pak Rupees)</i>		
< 10 m	9	4.1
10m - 50m	34	15.5
51m - 100m	30	13.6
101m - 200m	21	9.5
> 200 m	89	40.5
Not provided	37	16.8

Table I: Industries represented in the sample.

	Frequency	(%)
<i>Designation</i>		
CEO/Owner/General manager	34	15.5
Functional head	60	27.3
Middle management	65	29.5
Executive	46	20.9
Not provided	15	6.8
<i>Experience</i>		
< 5 years	56	25.45
5 to 10 years	94	42.73
11 to 15 years	34	15.45
> 15 years	36	16.36

Table II: Profile of respondents.

<i>Indicator (CR, AVE)</i>	Standardized loading
<i>Performance management context (CR = 0.86, AVE = 0.60)</i>	
PM1	0.76
PM2	0.76
PM3	0.81
PM4	0.76
<i>Social support context (CR = 0.89, AVE = 0.56)</i>	
SS1	0.85
SS2	0.73
SS3	0.68
SS4	0.76
SS5	0.76
SS6	0.71
<i>Supply chain agility (CR = 0.81, AVE = 0.60)</i>	
SCA1	0.89
SCA2	0.84
SCA3	0.56
<i>Organizational complementarity (CR = 0.85, AVE = 0.56)</i>	
OC1	0.90
OC2	0.86
OC3	0.64
<i>Innovation performance (CR = 0.88, AVE = 0.61)</i>	
IN1	0.87
IN2	0.83
IN3	0.78
IN4	0.68
IN5	0.72

Table III: Measurement model validation: reliability and convergent validity.

	Mean	SD	1	2	3	4	5
1: Performance orientation	4.96	1.16	0.77				
2: Social orientation	5.09	1.08	0.73**	0.75			
3: Supply chain agility	5.06	1.23	0.52**	0.54**	0.77		
4: Complementarity	5.14	1.10	0.52**	0.60**	0.56**	0.81	
5: Innovation	5.11	1.16	0.37**	0.39**	0.30**	0.34**	0.78

Notes: ** Correlation is significant at the 0.01 level; square-roots of AVEs are provided on the diagonal.

Table IV: Correlations, means and standard deviations.

	β	<i>p</i> -value
<i>Direct effects</i> ($\chi^2 = 1.87, p < 0.01; CFI = 0.95, RMSEA = 0.063$)		
Supply chain agility → Innovation performance	0.36	0.000
Performance orientation → Supply chain agility	0.30	0.081
Social orientation → Supply chain agility	0.51	0.011
<i>Indirect effects</i> ($\chi^2 = 1.87, p < 0.01; CFI = 0.95, RMSEA = 0.063$)		
Performance orientation → Supply chain agility → Innovation performance	0.11	0.074
Social orientation → Supply chain agility → Innovation performance	0.19	0.032
<i>Moderating effect</i> ($\chi^2 = 1.93, p < 0.01; CFI = 0.93, RMSEA = 0.065$)		
Supply chain agility × Organizational complementarity → Innovation performance	-0.13	0.042

Table V: Structural model results.

Appendix I: Measures employed in the study

1. Performance management context [*adapted* from Gibson and Birkinshaw (2004)]

- We set challenging/aggressive goals.
- We issue creative challenges to our people, instead of narrowly defining tasks.
- We encourage our people to be more focused on getting their job done well than on getting promoted.
- We make a point of stretching our people.

2. Social context [*adapted* from Gibson and Birkinshaw (2004)]

- We devote considerable effort to developing their subordinates of management staff.
- We give everyone sufficient authority to do their jobs well.
- We give ready access to information that others need.
- We base decisions on facts and analysis, not politics.
- We treat failure (in a good effort) as a learning opportunity, not something to be ashamed of.
- We set realistic goals.

3. Supply chain agility [*adapted* from Lee (2004) as validated in Whitten et al. (2012)]

- Our organization works hard to promote the flow of information with its suppliers and customers.
- Our organization works hard to develop collaborative relationships with suppliers.
- *Our organization designs for postponement.¹*
- *Our organization builds inventory buffers by maintaining a stockpile of inexpensive but key components.*
- Our organization draws up contingency plans and develops crisis management teams.

4. Organizational complementarity [Adopted from Cheung et al. (2010)]

- The resources brought into the transactions by each firm have been very valuable for the other.
- The resources brought into the transactions by each firm have been significant in getting the job done.
- Our two firms have separate abilities that, when combined, enable us to achieve goals beyond our individual reach.

5. Innovation performance [Adopted from Oke (2013)]

- Compared to our competitors, our business tends to be better at developing new products to meet customers' needs.
- Compared to our competitors our business tends to be more effective at taking existing ideas and making them into new products.
- The number of product innovations in our portfolio has been on the increase over the last 3 years.

¹ *Italicized* measures were deleted during the validation process.

- The percentage of revenue due to new products has been on the increase over the last 3 years.
- Compared to the industry average, the time it takes between the conception of an innovation and its introduction into the marketplace is significantly better.