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Organizational Culture and Open Innovation Performance in Small and Medium-sized Enterprises in Tunisia

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ABSTRACT

The purpose of this research is to investigate the relationships of organizational culture; utilization of open innovation (OI); and performance of medium-sized enterprises (SMEs). To test its hypotheses, the research assumes that there will exist a relationship between the organization's innovative culture (IC), which encourages employee creativity and learning, and both employee collaboration, and the variety of OI sources an organization utilizes. Additionally, the research tests the assumption that when an organization has an effective IC, it will generate higher levels of innovativeness, operational efficiency, and financial success. Data were collected from a sample of 263 SMEs in both the manufacturing and service sectors located in Tunisia. Structural Equation Modeling (SEM), utilizing AMOS software, was utilized to analyze the data. Results of the SEM revealed that IC had a statistically significant positive relationship with the number of OI sources utilized. IC also had a statistically significant positive effect on both an operational performance index and ROI (return on investment). These results indicate that creating an IC may be beneficial for companies; however, it is unlikely to result in increased product innovations. Instead, it is more probable to create improvements in the way processes are performed; in administrative functions; in marketing innovation; and in overall operational efficiency due to employee collaboration and knowledge sharing. This research adds to the body of literature around management science in that it provides further insight into how IC influences the use of OI and the resultant measures of operational and financial performance of SMEs.

Keywords: Innovation Performance, Organizational Culture, Open Innovation, Innovative Culture, Medium-Sized Enterprises

INTRODUCTION

An organization faces a substantial challenge in creating new ideas or innovations in the heteric and fiercely competitive marketplace of today. Creating new ideas, or innovating, is critical not only in good economic times but also in bad situations because companies can benefit financially from using innovation to optimize their performance (Arthur, 2008). Researche has demonstrated favorable cobad circustiminces between innovations and a company's overall performance (Hilman and Kaliappen, 2015; Hult et al., 2004; Verhees and Meulenberg, 2004; Guan and Ma, 2003).

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In a world characterized by the global and accelerated dissemination of knowledge regarding manufacturing and business processes, where low-cost manufacturers are being developed and product life cycles are shortening, there is a competitive and profitable necessity for continued innovation to maintain competitive advantages and sustain profitable growth (Chesbrough, 2003a). If an organization fails to continue to innovate, it risks turning products into commodities and losing brand identity and uniqueness (Chesbrough, 2003a). To avoid this trap of commoditization, there are two primary methods to pursue sustainable innovative activity: internally by allocating significant resources to develop internal R&D, or externally through acquiring and leveraging knowledge from external sources (Chesbrough, 2003a). The increasing availability of external knowledge and complementary assets due to new technologies has greatly improved the opportunity to acquire and leverage knowledge from outside the organization to develop innovative products (Chesbrough, 2003a). Due to the increased access to external knowledge and complementary assets, companies such as large corporations are increasingly attracted to knowledge multisourcing and sharing as a viable innovation management option (Chesbrough and Brunswicker, 2013; Chesbrough et al., 2006).

The open innovation (OI) paradigm, which is an "outside-in" strategy of obtaining innovations from external partners while simultaneously utilizing "inside-out" strategies of providing access to internal knowledge to facilitate collaboration and co-creation, is an alternative innovation management strategy (Chesbrough et al., 2006). Open Innovation (OI) is defined by Chesbrough et al. (2006) as the deliberate flow of knowledge and innovations into and out of an organization to improve internal innovation and enhance external use of innovations.

Open innovation management is concerned with identifying and capitalizing upon multiple innovation opportunities. As such, open innovation is rooted in the co-creation concept as suggested by Prahalad and Ramaswamy (2004), Vargo and Lusch (2004), and von Hippel (2005). It is important to note that Chesbrough (2003) was cited by Theyel (2012) as an example of organizational innovation; they stated that what makes OI novel is the way it combines internal capabilities with those of the external partners. The resource- based perspective emphasizes that an ongoing competitive edge is fundamentally derieved from an amalgamation of valued resources and capabilities. (Wernerfelt, 1984). This capability is also emphasized in the concept of service-dominant logic (Vargo and Lush, 2004).

There are numerous empirical studies that focus on the link between knowledge multisourcing and the level of innovations in companies that utilize the OI paradigm. These studies have consistently demonstrated a positive relationship between the acquisition of external knowledge and the performance of innovations (Zeng et al., 2010; Katila and Ahuja, 2002; Laursen and Salter, 2006; Bullinger et al., 2004; Piller and Walcher, 2006; Lettl et al, 2006; Mazur and Zaborek, 2015; Inauen and Schenker-Wicki, 2011). However, some studies suggest that the type of source strategy employed may influence the degree of success achieved (Kang and Kang, 2009; Laursen and Salter, 2006).

Research concerning the association among knowledge search behavior and the launching of new products identified two primary dimensions of knowledge search: depth, which means the frequency at which a firm uses its existing knowledge base, and scope, which represents the range of new knowledge that a firm seeks to acquire (Katila and Ahuja, 2002). Based upon these dimensions, Katila and Ahuja (2002) posited a nonlinear relationship between both search dimensions and the number of new products launched, to account for the potential negative consequences of over-searching. Utilizing secondary data, the authors analyzed their sample of industrial robotics firms located in Europe, Japan, and North America, and found that the number of new products launched was dependent upon the interaction of these two search dimensions. Notably, the authors found a linear relationship between search scope and product innovation, contradicting their original expectations (Laursen and Salter; 2006) also studied the effects of the breadth (scope) and depth of an organization's external search on organizational innovation. Using data collected from a survey of UK manufacturing firms, Laursen and Salter (2006) found that both broad and deep research typically enhance innovation performance, but only up to a point; once a firm acquires additional sources, the marginal benefits of each additional source decrease and eventually become negative. Several additional topics have been explored in the literature, including the identification of important sources of innovation (Enkel and Gassmann; 2008; 2010), motivation for engaging in OI (Van de Vrande et al., 2009), and the role of inside-out OI in enhancing business performance (Lichtenthaler, 2009).

Gassmann et al. (2010) noted the importance of investigating the cultural influences on the implementation of OI, highlighting the central role of organizational culture, including values, management style, information technology, and other factors that contribute to the successful implementation of OI. Gassmann et al. (2010), Huang (2013) and Huizingh (2011) expressed their concern about the lack of research related to OI in small and medium sized enterprises (SMEs) and were joined by. Gassmann et al. (2010) indicated that research on SMEs provides valuable sources of information for managers wishing to successfully manage open innovation.

In this context, this research aims to fill the knowledge gap regarding the impact of OC on open innovative practices and outcomes within SMEs. To this end, this research will be conducted through a survey of Polish SMEs operating in the manufacturing and service sectors.

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The formate of this study is as follows: Firstlly, the literature review presents several frameworks used to define and implement organizational culture (OC). The literature review identifies IC as a subset of OC and discusses the link between IC and the innovative performance of organizations. Finally, the literature review analyzes the dimensions of IC identified in previous research and in this study. Afterward, the paper introduces a conceptual model and hypotheses for this study and outlines the research methodology. Ultimately, the paper concludes by addressing the outcomes of the study and their implications.

LITERATURE BACKGROUND

Defining Organizational Culture

The term "organizational culture" is very common in the management sciences and is considered as a crucial element influencing an organization's success. Although most of research agrees on the significance of OC in the formation of behaviours within organizations, there is still little agreement as to exactly what OC is as described by Watkins (2013). Therefore, numerous definitions have been developed over the years. A simple and well-recognized definition of OC defines it as "the way we do things around here to succeed" (Lundy and Cowling, 1996). Denison (2021) has shown the impact of culture to organizational performance.

Schein (2004), while describing culture as an abstraction, states that its influences on attitudes and behaviors are tangible. According to Schein, culture is a dynamic construct that emerges from the interaction of individuals within an organization, is shaped by the leaders of the organization, and is constrained by the set of structures, routines, rules and norms that dictate and limit the behavior of the members of the organization. Therefore, this description of culture applies to both OC and group culture in general. Schein further indicates that the process of developing and managing culture is important to successful leadership. However, he warns against the assessment of cultures in terms of good vs. bad because, as he explains, all cultures interact differently with the broader social culture.

Conrad and Poole (2012) indicate that companies are entrenched in larger social environments and therefore cannot be completely understood without examining the values, beliefs, systems of structure and practice, tensions, and methods for resolving those tensions present in the social environment. Schein (2004) has provided a framework for organizing cultures based on shared attributes including observable behaviors, norms of groups, espoused values, formal philosophies, rules of engagement, and climate, etc. While these categories are related to culture and represent some of the ways culture manifests itself, according to Schein, they do not constitute the culture itself.

Schein also reported that culture is typically an innate characteristic of an organization; stable; and resistant to change. It affects each aspect of the dynamics of a group and integrates all the components of the group into a unified whole. He identifies three distinct phases of culture. First one includes artifacts which represent the visible attributes of culture, such as the physical environment, products, styles, myths, stories, and observed rituals. The conscious, proclaimed views and ideals of a group, including tactics, objectives, and philopspohies, are included in the second stage are sujected to discussion and modification. The final phase containes unnoticed, assumed belifes, views, emotions, and sensations that serve as the foundation for a group 's ideals and activities. This phase is the foundation of the culture.

Schein also sees OC as "the pattern of shared basic assumptions that a group has learned while dealing with the problems of external adaptation and internal integration that has worked sufficiently well to be deemed valid and then passed on to new members as the correct way to perceive, think, and feel with respect to those problems." (2004). Deshpande and Webster (1989) undertook a review of the dominant approaches to OC, building on the prior research by Smircich (1983). They identified five main interpretations of OC in the extant literature: firstly, as an exogenous; secondly, as an endogenous; thirdly, as an analogy for organizational knowledge systems in oorganization; fourthly, as an analogy for common symbols and interpretions; and finally, as an analogy for a subnconscious mind based on several scientific paradigms. The scholars assessed the paradigms as relevant to studies of marketing management and stated that the quicly evolving literature on OC has led to a multitude of definitional, conceptual and methodological difficulties that researchers must resolve. Notably, they highlighted the lack of consensus about defining and measuring OC and proposed their own definition: "the pattern of shared values and beliefs that enable members of an organization to understand why events occur, thereby providing a basis for learning the behavioral norms within the organization."

The cultural perspective is a "system of beliefs in which actors internalize a meaningful order concerning the organization" (Barney, 1986; Hurley and Hult, 1998). Plenty of researchers consider OC to be "the values, beliefs, and hidden assumptions that are shared by members of the organization," (Cameron and Quinn, 1999; Naranjo Valencia et al., 2010). This approach is based on the premise that hidden assumptions can be uncovered via the examination of observable values and beliefs (the latter referred to as espoused values and beliefs by Schein, 1989).

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Therefore, many empirical studies appear to prioritize artifacts, values, and belifes over the core of OC. As previously mentioned, the difficulty lies in the fact that various interpretations of artifacts, beliefs, and values can result in misunderstanding the main proposition that make up the hub of culture. Moreover, many of the research methods employed to measure culture, such as quantitative surveys, limit direct, in-depth engagement with organizations and their employees, which is critical in discovering the underlying assumptions of an organization's culture. Therefore, relying on observable proxy variables like values, opinions, and repeated behavioral trends appear to be a more logical approach to evaluate OC as we dominstrate in our study.

OC differs between different companies as well as departments within a single organization in the degree of ethical atmosphere with IC (Riivari et al., 2012). We contend that there only exists single OC for an assortment of people at any given time. Therefore, the assertion that "organizational culture plays a crucial role in fostering knowledge culture" (Oliver and Kandadi, 2006) may be interpreted incorrectly if the scholars see the existing culture as a favorable beginning point for developing an IC. Concerns like the ones mentioned above arise when investigating the connections between OC and IC in a corporation (Sharifirad and Ataei, 2012). We accept that OC can be, we agree that OC can be supportive of innovation; however, IC occure independently of the overall culture of an organization.

Organizational Culture and Innovation

As organizations' reliance on successful innovation by the close of the twentieth century increased, the need to understand the factors that influence a company's innovative capacity was clear. Mclean (2005) has created a concise timeline of studies on creativity and innovation in business. De Long (1997) states, "Any knowledge management strategy intended to improve business performance must address three components: (1) the work processes or activities that create and leverage organizational knowledge; (2) the technology infrastructure to support knowledge capture, transfer, and use; and (3) behavioural norms and practices often labelled 'organizational culture' that are necessary for the effective use of knowledge".

Organizational culture is significant in the context of innovation and knowledge management and has been demonstrated in many studies (Alavi et al., 2005; Chang and Lin, 2015; Kahn, 2021). Aspects of OC have been shown to affect the degree of innovative activity and the quality of results of that activity (Jassawalla and Sashittal, 2002; Higgins and McAllaster, 2002; McLean, 2005; Fagerberg and Verspagen, 2022; Naranjo-Valencia et al., 2011Laforet, 2015; Riivari et al., 2012). The literature evaluating the connection between OC and innovation, two primary categories of culture exist. The first category explores the limitations placed on innovation by culture (Mc Dermott and O'Dell, 2001). These studies often illustrate OC as a hindrance to innovative strategies.

Innovative capacity is "the ability to successfully adopt or implement new ideas, processes, or products." (Hurley and Hult, 1998).This capacity depends on the alignment of culture and strategy, which should complement each other to facilitate innovation. If the OC is incompatible with the strategy, then the strategy is most likely to fail. (McCracken; 2006), illustrated the issues that occur when the culture and strategy do not align by stating that "culture eats strategy for breakfast"

Therefore, when an organization has a solid culture, it may be more productive to adapt an appropraite strategy to adaereto the culture instead of trying to change the culture to fit the strategy (Gorman; 2007). Flynn and Chatman (2000) also discussed this dilemma. The second category of literature reviews the characteristics of OC that support innovation, including knowledge sharing and innovation-oriented culture (Oliver and Kendadi, 2006; Zakaria et al., 2004). Studies on how OC affects innovation identifies the differences in various types of innovation, including new market innovations and imitations. By distinguishing between the two types of innovation, the organizational cultures that provide the most support for each type can be identified, and contrasted with each other (i.e., adhocracy vs. hierarchical culture) as suggested by Naranjo-Valencia et al. (2011).

The present study's concern lies in the importance of literature regarding innovation management and knowledge management, particularly the way OC influences innovation performance. Much of this literature involves both theory and empirical studies. For example, a model developed by Martins and Terblanche (2003) illustrating the connection between OC and creativity. Hurley and Hult (1998) synthesized theoretical insights on innovation implementation using a market orientation perspective, along with empirical findings, demonstrating that cultures that prioritize learning, development and participatory decision-making tend to be more innovative. Zheng (2009) developed a theoretical framework that links cultural elements to the effectiveness of knowledge management systems. Many scholars have investigated the association between innovation and OC across different countries. For example, Deshpande et al (1993), examined the impact of OC on innovation in Japanese companies. Darroch and McNaughton (2001), researched the positive relationship between New Zealand firms' knowledge management practices (that included a learning culture and a responsive culture to market changes), and their high levels of innovation and financial success. Research by Sanz-Valle et al (2011), on Spanish companies, demonstrated that OC positively influenced both organizational learning as well as product innovation.

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Laforet (2015) demonstrated that an entrepreneurial culture, which emphasizes an outward orientation, flexibility, openness, and long-term focus, contribute positively on innovation performance (IP) among British companies.

Several researchers believe that knowledge centered leadership and human resources practices are elements that affect the link between knowledge discovery, methods of exploitation and results of innovation (Donate and Guadamillas, 2011). Therefore, based on the prior research cited, we predict that the IC of the companies in our sample will positively affect their innovative endeavors. While there is a substantial body of literature examiming the interplay between OC and innovation, as previously stated, there have been few attempts to combine the OI model with OC (Laursen and Salter, 2006; Inauen et al, 2011; Rass et al., 2013), which makes this an area worth exploring.

Thus, there is substantial proof to back up that a co-creative culture, that is receptive to outside ideas and willing to share knowledge, facilitates the implementation of the OI model. Unfortunately, researchers who study OC often overlook this factor. Santos-Vijande et al. (2013) referred to this type of culture as a "co-creation culture" when they investigated the role that customers and frontline employees play in influencing the innovation capacity and performance of service organizations. They found that service organizations that embrace co-creation are more concern on innovative than their counterparts.

Organizational Culture Dimensions and Measurement

When discussing the dimensions of an organization's culture, there has been considerable research conducted within the last few decades to measure organizational culture. There was a great deal of controversy in the 1990s as to whether it is possible to assess cultures, including those of organizations (Schein, 1992; Hatch, 1993; Denison, 1996). Although some researchers have questioned the ability to measure the fundamental assumptions that are at the heart of culture (Schein, 1992), many other researchers have attempted to develop systems that allow for the comparison of different cultural assessments, generally focused on values and norms of behavior (Denison et al., 2006; Homburg and Pflesser, 2000). A prominent example of one of these measurement systems is the Organizational Culture Model developed by Denison et al. (2006) who is a well-respected researcher in this area (Denison, 1984, 1990, 1996, 2000; Denison and Mishra, 1995, 1996; Fey and Denison, 2003). The model assesses four basic cultural characteristics: involvement, consistency, adaptability and mission. Each of these basic characteristics is measured through three separate 5 item indexes, giving the total of twelve cultural index (sub-dimension) measures (empowerment, group orientation, growth in capabilities, basic values, agreement, integration and collobration, bringing about change, customer orientation, organizational learning, strategic planning and aim, goals and objectives, and mission).

There have been numerous categorizations of OC presented in academic research and one that has been very influential among scholars is the framework presented by Cameron and Quinn (1999). They identified four major culture types: adhocracy, clan, hierarchy, and market cultures. The four major culture types were based on two sets of criteria: adaptablity/discretion vs. stability/control, and internal concentate vs. external concentrate. It is also possible to think of these two groups of requirements as OC dimensions. Using the behavioral manifestations of culture presented by Hofstede et al. (1990) Chang and Lin (2015) researched OC and identified the next eight setting standards: outcomes orientation vs. process orientation; strict control vs. flexible control; task orientation vs. employee orientation; open versus closed systems and professional approach vs. local approach. Each of the pairs of opposite descriptors corresponded to a unique cultural dimension (e.g. degree of control, and level of openness).

Dimensions and Indicators of Innovative Culture

Identifying the characteristics of the IC construct for application determining the parameters and indicators of our stydy model was necessary, so that the differences between organizations with innovative-oriented cultures and organizations without such cultures could be identified. Although many authors have written about organizational culture, there is no universally accepted set of dimensions that can be applied. While some authors expand upon what they refer to as "traditional" OC dimensions, other authors identify just a few dimensions of OC that reflect an organization's degree of innovativeness. Examples of questionnaire items and their corresponding dimensions are shown in Table 1. The various references used in this study were analyzed to determine how the three concepts: innovation culture, knowledge culture, and learning culture are expressed in academic literature. Considering the findings of this analysis, it appears that there are similarities in how the three concepts are defined in academic literature. Conversely, there are also references in the literature that provide examples of the same three concepts being defined differently, which depends primarily on the author(s) chosen definition of organizational culture. Acomparison of the authors' defintions of OC provides an illustration of this (Sanz-Valle et al., 2011), who use a very narrow definition of OC and therefore consider learning to be outside of the organizational culture.

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The conceptualizations and scale items from previous studies that were referenced in our research indicated the following constructs: Knowledge-centered culture, IC, elements of corporate culture that influence creativity and originality, Innovation-promoting cultural traits, The role of the corporate culture in Revolutionary Innovation in Products Capabilities and Culture that is focused on learning or information (Dobni, 2008; Hogan and Coote, 2014;Martins and Terblanche, 2003; Sanz-Valle et al., 2011 ;Slater et al., 2014). Based on the literature reviewed above, we determined that an OC has the capability to support innovation if it demonstrates three primary dimensions: (1) creativity and risk-taking (Santos-Vijande and González-Mieres, 2013), (2) internal cooperation (Donate and Guadamillas, 2011), and (3) learning orientation (Sanz-Valle et al., 2011). Therefore, the IC construct in our research model was comprised of the three dimensions previously described.

Examples of the expressions of internal cooperation comprise collobration across departments, power sharing, collobrative decision making, sharing and exchangeing knowledge, organizational dedication and mutual trust, teamwork, and communication with other people. Supportive systems to encourage creativity and risk-taking combibing risk assumption and ambiguity, empowering supporting reward schemes, encouraging experimentation and implementing new ideas, supporting change, providing support for the implementation of innovations. Employee motivation to grow and learn, learning assistance, and transparency are all signs of a learning focused workplace.

Focus on risk propensity are two strongly linked aspects of creativity in the innovation and risk-taking dimension. The relationships between creativity and innovation have been addressed by Amabile et al. (1996). Creativity is the creation of original and valuable ideas mostly at the individual level (Amabile et al., 1996), the process of coming up with, evaluating, developing, and putting these concepts into practice is known as innovation. "It is creativity that creates the innovation pipeline. To maintain relevance and continue competing for the pursuit of their mission, managers of organizations need to attend to both ends of the innovation process, creating creative ideas and utilizing their innovation process to create the potential value of those ideas". However, taking risks is a characteristic that allows for the development of more radical innovations due to the use of a bolder creative process, with greater amounts of resources used, and therefore a greater likelihood of collapse of the market. One might contend that if markets failure is not considered, creativity will be limited to only the most obvious and safe answers and will not allow for the development of the most innovative solutions. Similar content has been identified in prior research regarding the idea of receptivity to novel ideas (Baker and Sinkula, 2009).

It is commonly accepted that an organization capacity for innovation and performance is impacted by a focus on learning, often known as a learning orientation (Calantone et al., 2002). Developing a learning organization takes time to change the perceptions, values, and decision-making processes of people (Garvin, 1993). Studies distinguish between double-loop learning (innovative learning) and single loop learning (ad hoc reactions to a dynamic environment). Double-loop learning involves challenging norms and principles that are outdated and eliminating certain behaviours (Nystrom and Starbuck, 1984). But creativity and double-loop learning are not the same thing, which is defined as creating new ideas, whereas double-loop learning is defined as preparing the correct environments for creativity to occur. Learning ought to be kseen as a company-wide initiative because, to achieve a learning orientation, individual learning needs to be paired with organizational learning (Romme and Dillen, 1997).

Prior research has provided several examples of measures to determine elements of internal cooperation. For instance, Sanz-Valle et al. (2011) categorized measures of internal collaboration into four main categories: (a) organization-dominant characteristics (i.e., family-like work connections, accomblishiment orientation, etc.), (b) employee management (i.e., teamwork, autonomy, job security, etc.), (c) organizational glue (i.e., trust, commitment, goal accomplishment, competitiveness, etc.), and (d) criteria of success (i.e., human resource development, market competition and efficiency).

In addition to defining internal collaboration as a key component of a particular type of OC (collaborative OC), Sanz-Valle et al. (2011) found that collaborative cultures have a significant influence on organizational learning. A study by Pérez López et al. (2004) explored the impact of culture of collobration on company performance and learning within Spanish companies. Their results demonstrated that although collaborative culture is beneficial, it may not inherently result in a competitive advantage. Therefore, it must be accompanied by learning to increase competitive performance. This is consistent with our model of internal cooperation and organizational learning as part of an innovative culture.

OI Performance

In the last few years, Open Innovation (OI) has gotten a lot of attention in management studies. There were many studies about the performance of open innovation, especially its inbound side. It was very important to comprehend how the OC affects open innovation because it is linked to the performance in the environment that differs by the degree of innovation. IP can be defined as the success of companies in achieving their goals in

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relation to new goods, services, and innovative business processes or management methods (Henard and Szymanski, 2001).

Although there are many ways to assess the open innovation performance, all of them follow a similar scheme: they start with the direct impacts of innovations, then they assess the operational effectiveness and efficiency, and, at the end, they assess the financial results (see Thai and Liao, 2014, for a complete review of IP measurement literature and an original framework). Our approach follows this pattern. First, we assessed the direct performance of open innovation using the metric that represents the proportion of the company's income generated by new and modified goods (as shown in Table 2). Then, we assessed the operational performance of the company (in detail in Table 3). At the final stage, we assessed the overall profitability of the company (using the Return On Investment metric).

We also followed this logic when formulating research hypotheses, wherever we proposed a favourable relationship between the usage of open innovation sources and the income from new and altered goods. In addition, we extended our research hypotheses to relate the open sources of innovation to both operational and financial performance metrics to get the entire range of open innovation effects. We expected weaker effects in the differences in sales of new and updated goods and stronger effects on the financial metrics at the business level. This hierarchical effect was designed to increase the clarity and the sensitivity of the analysis.

This study contributes to the existing body of research that examines how different factors affect the relationship between open innovation and business performance. As such, these contextual factors are acting as moderators in the regression analysis that connects open innovation practices to the various performance indicators. Many researchers identified some of the other contextual factors that include but are not limited to the market orientation, as well as social capital (where the OC is considered as one of the components of social capital (Rass et al., 2013), access to both tangible and intangible resources (Garriga et al., 2013), and the degree of competition (Foroughi et al., 2013). For example, the innovative culture that we analyzed in this work could be treated as one of the contextual factors.

Developing Research Model and Hypotheses

The purpose of the research is to evaluate the hypotheses surrounding the operationalisation of IC and the connections between this idea and pertinent efficacy and productivity indicators. The diagram below shows the breadth of the study along with all the hypotheses for better understanding.

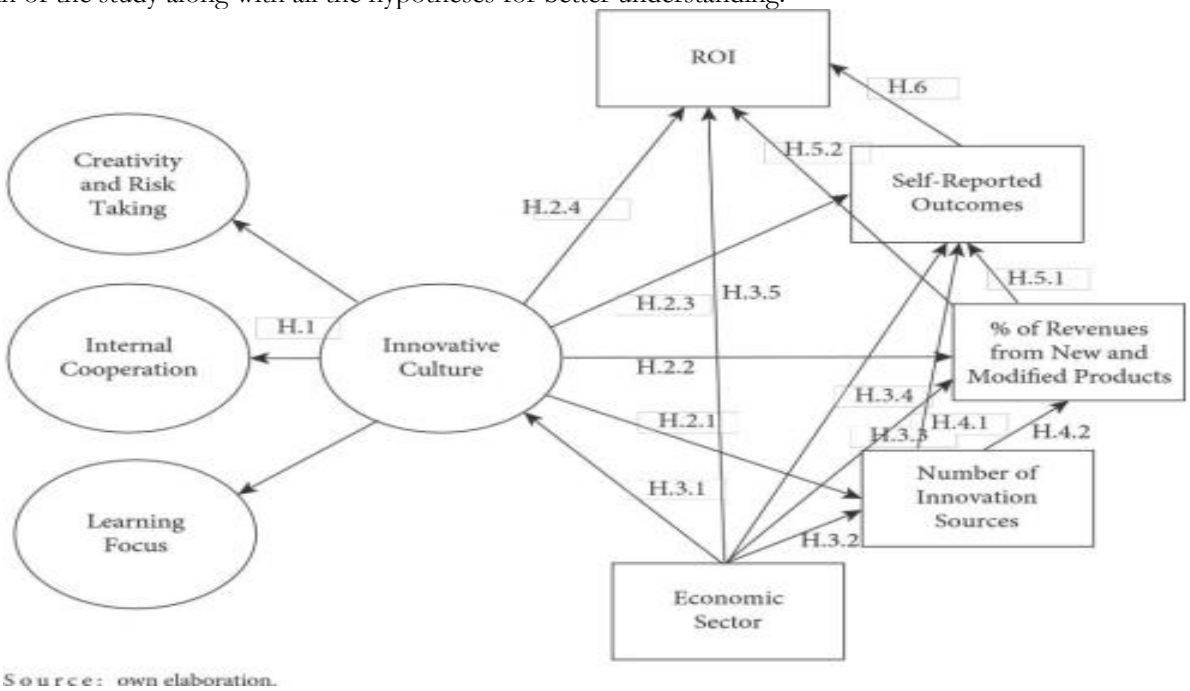

Figure 1. Research model and hypotheses

We propose:

H1: IC is a second order reflecting construct assessed using three first order sub-constracts of creativity and risk taking, learning focus and internal cooperation

H2: IC correlates positively with:

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H2.1: The number of innovative sources (IS) used.

H2.2: The percentage of revenues from new and modified products

H2.3: Self reported outcomes (SRO)

H2.4: ROI

H3: There are differences between the economic sectors (ES) of manufacturing and services about:

H3.1: IC

H3.2: The number of IS used

H3.3: The percentage of revenues from new and modified products

H3.4: SRO

H3.5: ROI

H4: The number of innovation sources used is positively correlated with:

H4.1: Percentage of revenues from new and modified products

H4.2: SRO

H5: The percentage of revenues from new and modified products is positively correlated with:

H5.1: SRO

H5.2: ROI

H6: SROs are positively correlated with ROI

The hypotheses of this paper (H1-H6) are based on the findings of the previous literature survey. They are designed to test the influence of the range of IS that a company uses on its performance indicators (both operational and financial). These analyses consider the effect of a company's innovative culture and of the ES of the company. As for the classification of the ES, it divides the companies investigated in the study into two categories: companies operating in the manufacturing sector and those operating in the service sector, all operating in the B2C market.

Based on the above-mentioned empirical studies (Victorino et al., 2005; Grawe et al., 2009; Hilman and Kaliappen, 2015), we expect that there will be significant differences in the interaction between OC and innovation for the two types of companies. For example, in many cases, service innovation arises directly from contact with customers and their individual demands (Victorino et al., 2005). Even though technology has made possible almost instant communication between a company and its customers, frontline employees of service-oriented companies are able to directly see customers' experiences and develop tailored service improvements, and therefore they can also generate larger organizational innovations. Studies have demonstrated and empirically confirmed relationship between service innovation and company performance (Grawe et al., 2009; Hilman and Kaliappen, 2015). Thus, the ES is considered as a control variable in this research. I removed the last sentence of your original text ("we hope to find evidence for some of the expected relationships") since I was asked to "never answer the question." That is because you want me to paraphrase only the rest of the information that you provided.

Operationalization of Research Variables

A few of the variables included in the proposed hypotheses require multiple indicators since they cannot be measured directly. These types of latent or "hidden" variables, also referred to as constructs, comprise the elements of the IC (which are examples of reflective constructs) and the self-reported measures (which are an example of a formative construct). Scores of relevant aspects of OC were generated using a five-point Likert scale. Respondents indicated their degree of support for each statement provided. On a scale of one to five, respondents evaluated their answers to each of the individual items, which were then employed as input for the confirmatory factor analysis (CFA) carried out during the structural equation modelling phase. The outcome of CFA permitted us to determine the value of each first- and second-order construct, as well as validate the reliability of the measurement model for IC. The intention in creating the index of self-reported results was to measure potential operative impacts of increased proportions of new and altered products in firm income.

Self-reported results were assumed to function as a middleman between a measure of the immediate efficacy of innovation policies (the proportion of revenue produced by new and revised products) and a monetary indicator (ROI). The absence of middlemen may limit the successful identification of innovation impacts, especially if the impacts of innovation are too minimal to immediately affect ROI. Self-reported results were gathered via a series of yes-or-no inquiries. Consequently, a composite variable was generated by adding the total number of points

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awarded to each company for each inquiry, with "yes" receiving a score of 1 and "no" a score of 0. This type of scoring has been extensively used with formative constructs. Consequently, the newly developed variable may range from 0 to 7, with higher ratings indicating enhanced performance.

The third variable was the number of sources of innovation used by the firm over the three years prior to the date of the interview. The objective of this variable was to assess the scope of the firm's participation in internal and external open-source innovation, i.e., the firm's use of knowledge from many different actors inside and outside the firm and its value chain. By totaling all the innovation sources identified by respondents from a previously specified list of 14 innovations divided into those internal to the supply chain of a firm (six items) and those external to the supply chain of a firm (eight items), the values of the index were established. Les groupes internes étaient composés d'employés de la R&D, d'autres employés, de distributeurs, de consommateurs, d'internautes anonymes et de fournisseurs. Le second groupe d'éléments comprenait les achats de licences, les achats de brevets, les achats de technologies, les acquisitions et rachats d'entreprises, la reproduction des solutions des concurrents, les accords avec les universités et les instituts de recherche, ainsi que l'assistance de consultants. The list of items was constructed largely based on the survey of Chesbrough and Brunswicker (2013). The most recent addition to the list of items was "to replicate the solutions of competitors," since I thought it would be very important for SMEs. According to van de Vrande et al. (2009), the list of items was supplemented with the inclusion of the employees of the firms (from the R&D department and outside of the R&D department).

Sampling Strategy

Survey data were collected in February-March 2025, which resulted in a final net sample of 263 responses, corresponding to a response rate of 35 percent. Respondents were randomly selected from an extensive database including virtually all industrial and service firms in Tunisia, kept up by a research company responsible for the execution of the interviews. There were no statistically significant variations when comparing the net sample and the population on recognized characteristics, demonstrating that the response rate did not negatively impact the generalization of the results. The database provided valid financial metrics for the firms, with ROI used in this study to supplement the findings from the surveys. Of the firms surveyed, 47.4 percent were manufacturing firms, and 52.6 percent were service firms; in addition, 67.2 percent of the firms surveyed had between 10 and 50 employees, and 32.8 percent of the firms surveyed were SMEs having 51 to 250 employees.

RESEARCH FINDINGS

The hypotheses were tested employing Structral Equation modeling (SEM) using Amoss 22. This method allows you to evaluate all regression paths simultaneously in one statistical test. In addition to testing multiple regression paths, SEM provides measures of association between pairs of variables that can be used to assess individual bivariate associations. Figure 2 illustrates the structural model of this study, along with the standardized regression coefficients and multiple correlations. For purposes of understanding the model and how it relates to the dimensions of the model, it is useful to consider that the conceptualization of an organization's IC was viewed as being reflective in nature. Reflective conceptualizations have been employed in prior quantitative research regarding organizational IC. It is expected that the three dimensions of IC will relate to each other since they represent measurements of the same latent construct. Factor scores representing IC across all participants are produced by the SEM procedure based upon the common variance among the dimensions IC. These factor values are then utilized as input to the regression analysis of the structural model. Therefore, the structural model represents the shared variance of the dimensions IC and does not provide a basis to regress individual dimensions of IC to performance outcomes.

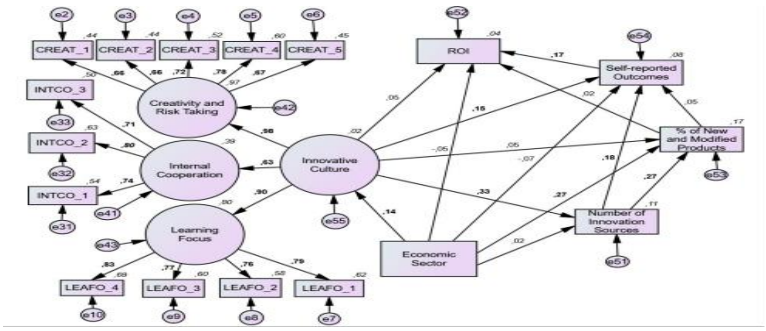

Figure 2. Structural model digram

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To enable the comparison of manufacturing and service companies as distinct entities based on their cultural specificities in terms of innovation, measurement consistencye was tested by using two structural models: one generic model and one nested model. The first model contained no restrictions on regression coefficients for the relationship between second-order constructs and their first-order constructs or the relationship between the first (initial) -order constructs and their cues. Therefore, companies classified as either manufacturing or service providers had unique regression coefficients.

In contrast, the second model restricted these regression coefficients to be the same for both types of companies. A comparison of the results indicated a chi-squared difference of 7.945 with 9 degrees of freedom and a p-value of .540. Therefore, because there was no notable poor fit in the second model when using the same regression coefficients for both manufacturing and service providers, all companies were included in a single group, and the unified solution that utilized the same regression coefficient values for all firms was selected for additional analysis. Including all firms into a single group and utilizing the same regression coefficient values for all firms resulted in a simpler and more attractive theoretical solution for developing broader generalizations. The binary variable representing the ES of the firm was added to the structural model, and the unique characteristics of both types of firms were represented by the binary variable to determine if the ES of the firm influenced the level of IC and/or other outcome variables.

As the subsequnt stage to assess the quality of the model, it is necessary to examine the overall fit of the model, specifically in terms of how well the model replicates the true relationships and correlations observed in the data. Several commonly used goodness-of-fit indices were computed (see Table 1). The primary purpose of goodness-of-fit indices is to measure the degree to which a model can replicate the covariance matrix developed from the actual data collected in the study; however, the specific methods for calculating goodness-of-fit indices vary widely across research settings, and the indices themselves are based on distinctly different assumptions. For example, an index may assume that the model perfectly captures all of the variance present in the data (e.g., the Goodness of Fit Index), while another may assume that the model does not capture all the variance in the data (e.g., the Root Mean Square Error of Approximation). To provide some context for interpreting the goodness-of-fit indices, the table provides recommended thresholds for identifying well-fitting Structural Equation Modelling (SEM) solutions (Garson, 2012).

Table 1. Total Model Fit Indicators

Metric	**Value**	**Minimum for Snugly fitting model**
Chi-square/df	1.648	Preferable if less than 2
p-value for the model	<0.001	Lower than .05
GFI	0.95	Greater than or equall 0.9
AGFI	0.93	Greater than or equall 0.8
RMSEA	0.038;HI90=0.048	Preferably if less than.05
PCLOSE (p-value used to test the null hypothesis that the population root means square error, measured by the RMSEA, is less than or equal to 0.05)	0.974	≥0.05

Fit indices demonstrate that the structural model adequately replicates the empirical data. The chi-square test, however, shows some problems with precision because a low p-value is associated with the rejection of the null hypothesis, i.e., rejecting the null hypothesis that there is no statistical difference between the empirical covariance matrix and the covariance matrix produced from the model. Although Byrne (2010) states that the chi-square test has been found to have unreliability when dealing with larger samples of data, due to its tendency to inflate chi-square values such that a model that fits reasonably well will be rejected. As a result, several other indexes are used to assess the reliability and validity of a CFA solution, depending upon the type of fit or data assumptions made. Bowen and Guo (2012) stated that the chi-square statistics should always be included in the report; however, regardless of whether the chi-square statistic was statistically significant, the model could still be considered an acceptable fit if the other selected fit indexes meet the specified criteria. All five additional indexes selected in this study support the conclusion that the model is an acceptable fit. The overall fit measures do not provide insight into the reliability and validity of each latent variable in the model. This problem is addressed through three additional measures calculated for each of the subconstructs of the model as presented in Table 2.

Table 2. Reliability and Validity Indicators for the Dimensions of Ic.

Construct	**Cronbach's Alpha**	**AVE**	**MSV**
Learning Focus	0.86	0.62	0.46
Internal Cooperation	0.78	0.56	0.39

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Innovation Focus	0.81	0.49	0.46

Reliability describes the uniformity or dependability of the results obtained from repeated measurements. Reliability measures the degree to which a scale offers consistent findings produces the same results when measuring the same phenomenon in the same population. Cronbach's alpha is a common measure of reliability for multi-item scales and is used to determine whether the items of a scale measure the same dimension (Malhotra, 2014). If Cronbach's alpha is .60 or higher, the scale is said to be unidimensional and therefore reliable. Since all three of the factors had Cronbach's alphas of .60 or higher, it is reasonable to assume the scales for all sub-variables were suifficient reliabile.

Validity is another fundamental concept, which comes in several forms. Among these, convergent validity is one of the most frequently used. Convergent validity refers to the connection between a variable and its measures (manifest variables). How much does the variables explain their measures? To establish convergent validity, researchers use the Average Variance Extracted (AVE) measure. Researchers have determined that if the AVE is > .50, there is adequate convergent validity (Hair et al., 2010). Looking at the AVE values for the three variables, we see that two of them were > .50 and one of them was right at .50. Therefore, it seems plausible to derive yhat every measurement relement of SEM has adequate convergent validity.

Discriminant validity is also important for evaluating the quality of scales for measuring latent variables. Discriminant validity refers to the ability of a construct to distinguish itself from other variables. That is, how much better is a construct represented by its own indicators rather than those of another construct? There are a few ways to evaluate discriminant validity, but one of the most widely accepted methods is to compare the AVE to the Maximum Shared Variance (MSV). If AVE for each construct is greater than the MSV, then the model will likely be deemed acceptable (Hair et al., 2010). Using this method, we see that our model has satisfactory discriminant validity.

It is apparent that the measurement model performed well using the various diagnostic statistics, thus supporting Hypothesis H.1. Next, we continued our examination of the structural components of the model. These components consisted of regression paths that connected IC, operational and financial and operational outcomes measures, the quantity of IS, and the kind of ES. The path graph presented standardized regression parameters for (betas), which are like Pearson correlation values. Bold highlights indicated significant beta values. Addationally, squared multiple correlations, that indicate the perecentage of variance accounted for by every single peredictor in the overall model, were displayed on italics on the upper-right portion of every endogenpus variable on the research diagram. The hypotheses may be supported by its beta s' significant.

Even though the pathway diagram may be used to swifty assess the hypotheses, for purposes of assessment, it might be more effecrtive to show all pertinents regession routes in a table structure. As illustrated in Table 3, we observed that only half of the direct effects supported the hypotheses (7 out of 14). It is important to emphasize that these direct effects do not consider the indirect effects that the variables may exert through other intermediate factors.

Table 3. Summary of hypothesis testing based on the significance of direct effects.

Predicting factor	**Outcome factor**	**β**	**p-value**	**Hypothesis**	**Validation outcome 1: supported 0: falsified**
IC	Number of used IS	.330	<.001	H.2.1	1
IC	Percentage of revenues from new and modified products	.050	.333	H.2.2	0
IC	SRO	.148	.008	H.2.3	1
IC	ROI	.050	.354	H.2.4	0
ES	IC	.139	.009	H.3.1	1
ES	Number of used IS	.016	.737	H.3.2	0
ES	Percentage of revenues from new and modified products	.268	<.001	H.3.3	1
ES	SRO	-.075	.132	H.3.4	0
ES	ROI	-.049	.334	H.3.5	0
Number of used IS	Percentage of revenues from new and modified products	.268	<.001	H.4.1	1
Number of used IS	SOR	.177	<.001	H.4.2	1
Percentage of revenues from new and modified products	SOR	.051	.322	H.5.1	0

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Percentage of revenues from new and modified products	ROI	.015	.767	H.5.2	0
SOR	ROI	.171	<.001	H.6	1

Although innovation culture had a significant and positive association with the number of innovation sources that organizations employed, it has no direct influence on the success of the implementation of these innovations in the marketplace. However, when considering the indirect effects through the moderation of the number of innovation sources used by the organization, the overall effect size increased from a .05 beta to a .14 beta, where the increase is statistically significant. Therefore, the existence of the indirect effects supports Hypothesis 2.2 partially.

The presence of an OC with an innovative nature demonstrates a greater degree of operational efficiency, as measured via self -reported results. There is no direct link between OC and ROI, as the path of the regression of ROI on the construct was not statistically significant, however, after controlling for the mediating variables, the overall effect of the construct of IC on ROI was positive and statistically significant, although weak (beta = .089; p-value (bootstrap estimates) = .048), which can be viewed as a partial confirmation of Hypothesis 2.4.

DISCUSSION AND CONCLUSIONS

The results of the analysis showed both similarities and differences in how producers and service providers utilized innovation in their businesses. Service companies reported a much higher level of innovation and generated a higher proportion of their income from new and modified products. Both business segments reported using the same diversity of innovation sources and achieving the same levels of IP (i.e. self-reported outcomes), however they differed in terms of the return on investment (ROI). Companies that generate a higher proportion of their income from new and modified products do not demonstrate a higher level of operational and financial performance. Participation in Open Innovation (OI) will improve operational performance and the number of innovation sources utilized by a firm was directly correlated with the self-reported outcomes.

The links between intellectual capital and open innovation indicate a positive correlation between intellectual capital and the use of open innovation; however, this relationship is complex and not systematically linear. New and modified products do not always produce a profit greater than those of older products. The data does not provide insight into what te profit of the new products would have been if the new products had not been developed; it is possible that the new products did not create a competitive advantage but rather sustained the competitive position of the firm. This is due to the competitive nature of the markets in which both the manufacturing and service sectors operate, and the short product life cycles.

There are several reasons why the relationship between revenues percentage produced from new and altered products and overall financial and operational performance may not exist. One of them is the type of product innovation. The survey metric used to measure the types of product innovations did not differentiate between the degree of novelty of these product innovations and thus included a wide range of product modifications and enhancements to existing products. Baker and Sinkula (2002) identified three categories of product innovations in relation to the relationship between a company's market orientation and learning orientation, which are:

1. Product innovations that are management driven and modeled after other successful models.
2. Product innovations that are market driven and result from a company's ability to adapt to changing customer needs.
3. Continuous radical product innovations that result from a company's ability to learn and challenge the conventional view of the market (also referred to as generative learning).

Given the above categories of product innovations, A significant percentage of the revenue that came from the new and altered products manufactured by SMEs in Poland falls into the first two categories. These types of product innovations represent incremental changes to a company's existing products that are not likely to have a significant impact on a company's competitive advantage. Thus, the introduction of new product innovations does not ensure business success; a company must introduce product innovations that offer consumers something new and valuable to compete successfully.

As stated previously, the data indicated that companies that excel at learning and rapid innovation can enjoy efficiencies from the implementation of open innovation. This is shown through the positive correlations between an IC, the diversity of IS utilized, and self-reported outcomes. Return on Investment (ROI), the only metric in the model obtained from a secondary source outside the survey also appeared to be positively affected by both direct and indirect influences from a company's culture of innovation.

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The data provided evidence that companies that excel at learning and innovation can indirectly benefit from improved efficiencies. This is evidenced through the positive influence of an IC and the variety of innovation sources utilized on self-reported outcomes. In addition, the data suggested that ROI, the only metric in the model that was obtained from a validated financial database, as opposed to the survey, is positively affected by both direct and indirect influences from a company's culture of innovation. Comparing the findings of the study to previous research revealed both similarities and differences in previous studies; however, the reference to previous studies helps to provide additional context for the patterns present in the data of this study.

Most research suggests that IC creates more innovations. Although these innovations are not always product related. Skerlavaj et al. (2010) identified that organizational learning culture, a component of IC in this study, generates a wide array of innovations including technical and administrative innovations. Ali and Park (2016) found that IC positively affects process and management innovations, however it has little impact on product innovations. This study shows a similar pattern where IC has a positive relationship to a wider variety of innovation sources and a higher number of innovation sources; however, IC does not correlate with a higher percentage of revenue from new or modified products. The explanation for this phenomenon may be because most innovations created by OC are managerial or process-oriented and thus not the focus of this study. Managerial and process innovations, which were not measured in this study, may greatly influence the relationship between IC and performance metrics in this study.

Toaldo et al. (2013) identify the connections between IC, marketing strategy processes, and organizational performance. The authors investigated the marketing research process through multiple best practices, as measured by Likert scales. Of particular interest to this study is that Toaldo and colleagues found that while there was no statistically significant relationship between IC and performance, there was a substantial indirect effect on performance, mediated by marketing processes. The authors interpret that an IC may either enhance marketing processes or encourage the adoption of better practices, rather than simply creating product innovations.

This perspective is further reinforced by Damanpour and Gopalakrishnan (2001), who investigated the relationship between innovation and performance in commercial banks. The authors found that high-performing banks were able to implement both product and process innovations more frequently than lower-performing banks. This implies that the innovation-performance relationship is not solely dependent on product innovations. In a follow-up longitudinal study that included a broader range of public organizations, the authors explored this idea further, concluding that the relationship between innovation and performance relies on the mix of innovation forms, such as service, technological process, and administrative process innovation over time. Companies that continually adjusted their innovation strategies to meet evolving market requirements performed better than organizations that did not (Damanpour et al., 2005).

This study supports the argument that product innovations should be accompanied by other forms of innovation to maximize the potential for success. The study also provides additional insight into the apparently limited influence of an IC on sales from new products. Chatzoudes et al. (2015) found that the development of knowledge creation and dissemination processes within organizations is positively impacted by IC. However, the positive relationship between IC and the development of product innovations tends to occur gradually. Since the survey used in this study was cross-sectional in nature and not longitudinal, the study was unable to assess the time delay between developing an IC and its subsequent effects on sales of new products. This time delay may act as a confounding variable and make the regression coefficient appear insignificant.

A study of 223 service firms across Asia found that strategic orientation positively moderates the association between OI and innovative performance. Cheng and Huizingh (2014) found that entrepreneurial orientation positively moderates the connection between OI and innovative performance more than either market or resource orientation. The characteristics of entrepreneurial orientation such as proactivity, risk-taking behavior, creativity, and strong support for the innovation process are highly related to the definition of IC used in this study. These findings are consistent with this study and reinforce the notion that similar trends exist in different geographic and industry contexts.

The discussions presented above highlight the limitations of this study. Some of the limitations include the lack of measures for non-product innovations (e.g. process, marketing, and administrative innovations) which may have a stronger relationship with IC. Another limitation of this study is the lack of data representing longer historical time frames, which would allow for the assessment of long-term effects of IC. Also, the study did not differentiate between radical and incremental innovations, which may reveal new relationships in the data. Future research should attempt to remedy these methodological limitations. Another area that was not addressed in this study is employee perception of a culture that supports innovation. Factors such as management support for innovation, organizational reward systems for innovation, and workload pressures associated with innovation have been identified as important variables that influence innovation performance. Chandler (1993) states, "Some organizations perform better when key employees believe they are rewarded for being innovative, while others perform better when employees believe they are rewarded for conforming to the rules and not innovating."

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Chandler et al. (2000) note that the mixed role of rewards may contribute to the variation in IP explained by the current model, and therefore merits further examination in subsequent studies.

The study provides several practical implications and recommendations for managers and practitioners. (1) The study demonstrates that the revenue generated from new and modified products is disconnected from performance metrics. Therefore, managers may need to consider the possibility that prioritizing product innovations may not be the most effective strategic option, especially for companies seeking to improve their operational efficiency and profits. It is evident that not all product modifications contribute positively to these objectives. (2) Managers who create a culture of innovation tend to utilize a wider variety of innovation sources and report better outcomes, specifically regarding operational performance and return on investment (ROI). Therefore, it is essential for managers to recognize that the creation of a culture of innovation can have positive impacts on administrative, marketing, and process innovations, which are likely to be responsible for the observed improvements in operational and financial performance. Benefits of these non-product innovations may include greater flexibility, enhanced collaboration, improved knowledge acquisition, and greater efficiencies among functional units. (3) The study demonstrates that the cultivation of an IC may provide benefits beyond the traditional focus on product innovation. The results of the study demonstrate that the establishment of an IC can positively affect the number of innovation sources utilized, the self-reported outcomes, and return on investment (ROI) in companies.

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