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The Impact of Open Innovation on Organizational Performance: Mediating Role of Social Capital in Small and Medium Enterprises in the Kingdom of Saudi Arabia

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Abstract

The paper aims to find out how changes in climate change affect how people think and feel. This paper analyzes 1456 papers published in WOS data from 1964 to 2022 that assessed the impact of climate change on knowledge, attitudes, behaviour, and policy preferences. We used a comprehensive search technique to identify and analyze the articles. VOSviewer, Bibliometrics, and Biblioshiny from R were used in the bibliometric study to reveal new research trends in climate change.The results show five sub-fields of research in this area (climate change, global warming, uncertainty and policy, human activities, land usage, and risk assessment). Other topics comprise the study of trends in this discipline, such as systems, design, snow, river basins, and change impacts.Our analysis indicates several gaps and problems in the climate change literature. There is, for example, a scarcity of studies on climate justice and the social and political components of climate change. Additionally, many studies focus on wealthy countries, leaving out the effects of climate change on vulnerable populations in developing countries.We find that the research areas for climate change trends in those publications give a complete perspective of the climate change research landscape, which may be used to drive future research agendas and policy decisions, etc. Lastly, we suggest different directions that climate change research could go in the future. These include more collaborations between different fields, a stronger focus on the social and political aspects of climate change, and a stronger focus on how climate change affects vulnerable groups.

Keywords: *Open Innovation, Social Capital, Economic Performance, Operational Performance, Smes.*

Introduction

Recently, it was common for companies to conduct their development processes relying exclusively on the support of internal resources, according to a model based on the notion of "closed innovation." This model considers the company as an integrated system in which the innovation activity internally depends on research and development. As such, the company operates as an autonomous entity, following the steps that lead to the production and marketing of its products and services. When internal R&D resources are sufficient to guarantee ongoing development of new goods, services, or technological processes, the closed innovation policy provides advantages. If this is not possible, it is wiser to concentrate on another approach in order to establish a network involving external actors like research institutes, the academic community, start-ups, and stakeholders. Over the past decade, the scientific literature has shifted its focus from closed innovation, where knowledge and technology are developed internally by the companies themselves and innovation processes occur exclusively within the company's boundaries, to open innovation, where it is recognized that innovative ideas and knowledge circulate spontaneously both internally and externally to a company.

Indeed, market uncertainty, the complexity of innovation, and the recombination of knowledge have led to greater flexibility in the organizational structures of companies and the necessity to interact with the external environment and stakeholders in a more open manner. Nowadays, companies are faced with constant challenges both internally and externally due to a competitive and ever-evolving market. Innovation activities have become increasingly difficult, with top managers employ different open innovation models to remain competitive (Ansari, R et al.,2016). The adopted strategies, such as the acquisition of external technologies and the exploitation of internal technologies, can greatly enhance the innovation performance of companies. Thus, open innovation can be considered a research approach aimed at integrating internal

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and external contributions for the development of new products. To implement an open innovation strategy, it is necessary for companies to engage in innovation activities – the sale and purchase of licenses and patents, as well as the exploitation of intellectual capacity – in order to transform value creation into the optimal combination of internal and external resources (Bigliardi B et al., 2020) Open innovation is primarily carried out through three different modalities: the acquisition of external technologies in open exploration processes (inbound innovation); the external transfer of technologies in open exploitation processes (outbound innovation); and coupled innovation. The concept of open innovation has gained prominence in both academic study and business practice, and it is currently gaining traction in the field of public policy. Due to constrained innovation cycles, open innovation has significantly increased in significance for both practitioners and scholars over the past 20 years. Similarly, because knowledge management is becoming more and more important in the industry, open innovation has drawn interest from academics, practitioners, and oil companies (Asif et al., 2021). The process of innovation is heavily reliant on the exchange and utilization of knowledge obtained from the external market. Companies are renowned for their capacity for innovation. Thus, open innovation is generally observed to be more common in oil companies. In economies where businesses must continuously search for opportunities and coordinate resources. These are the basic strategies on which companies must rely to gain sustainability and competitive advantage.

Therefore, managers and owners, in different contexts, must stimulate operational efficiency to gain a competitive advantage. Recently, Asad et al. (2021) stated that due to the increasing use of big data, entrepreneurial-oriented companies are leveraging open innovation. While research on quality management seems to focus more on understanding its importance for organizational success, these practices are therefore still directed from within the company. However, the company is expected to strongly engage in open innovation to achieve better performance (Krajcsák, 2019); similarly, the same impact has been analyzed in the corporate sector (Khalfallah et al., 2021) and the same influence for companies in the oil sector has not yet been analyzed, despite the fact that these companies are more influenced by the market than large corporations. Thus, the quality management practices implemented by companies seem to complement open innovation, which has not yet been subject to empirical evaluation, particularly in Saudi Arabia.

Despite the conceptual rigor, the role of open innovation practices in achieving organizational performance, particularly in the context of oil companies operating in developing countries, deserves the attention of researchers. Similarly, the impact of total quality management practices and firm performance, as well as the link between corporate organization and firm performance in the oil sector, have been studied separately by researchers, mainly in developed countries, and the mediating role of social capital has received little attention from researchers. Due to a highly competitive market, innovation processes become more open when companies need to become more competitive, with firms often being forced to strengthen their innovation efforts at a significant financial cost. Social capital improves employees' ability to collaborate and learn.

The expertise, knowledge, and capabilities of current employees create value and help address company issues (Salehi et al., 2023). According to Leckel et al. (2022), social capital is the total of the potential and real resources that are accessible through a web of connections that belong to people or social units. Real and potential resources made available by a network of actors' ties with one another are referred to as social capital. Because it gives access to information, skilled labor, and financial resources, social capital is crucial for entrepreneurship. The degree to which a group or society is cohesive in comprehending and exchanging knowledge is referred to as social capital. Company performance, the company work environment, and social capital are all positively correlated. Performance and competitive advantage are impacted by strategic innovation, which is influenced by social capital. To boost their commercial success, companies need to cultivate their creativity through open innovation networks. The intricate synchronization of social and human elements in society is necessary for information acquisition and knowledge creation (Utama et al., 2023).Three essential functions of social capital are collective decision-making, activity coordination, and information exchange. Each of the three duties is essential to the success of tourism. Social capital is what enables innovation and exchange activities. The innovation process can be developed to enhance operations

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once social capital has been established. Most of the literature has revealed the positive effect that the application of open innovation (OI) activities by a company has on its innovation performance. Indeed, an increase in the interactions a company has with other organizations generates better access to new ideas, skills, technologies, and other intangible assets, as well as greater opportunities to innovate successfully.

An interesting research avenue would be to explore the effects of the dimensions of IO on corporate performance and internal R&D, and to examine the impacts of social capital on the interactions between different types of IO and corporate performance (Odriozola-Fernández; 2020).

The influence of open innovation activities on corporate performance has been extensively analyzed by the scientific literature; in particular, the implication of innovation performance on the cost-benefit ratio of R&D, the acquisition of patents and the protection of intellectual property, the relationship between appropriation and openness on efficiency and novelty, and the impact on the development of new types of products or on financial performance (Bigliardi B;2013) . Detecting the main variables and elements influencing open innovation and company performance remains a challenge for research. It is useful to understand the activities and processes that enable open innovation by taking into account various aspects related to knowledge management strategies and the role of human resources (Alzu'bi, F. A., & Al-Jaghbeer, M. I. (2019).Therefore, using the theoretical lenses of resource-based vision (RBV) and social capital theory, the aim of the study is to identify the mediating role of social capital between open innovation and firm performance. Additionally, this study sheds light on the mediating impact of social capital on economic and operational performance. In contrast to the existing literature, this study attempts to present a thorough framework concerning the organizational performance of oil companies in Saudi Arabic. This study contributes to the existing knowledge by examining the intervening effects of social capital in the association of social capital and organizational performance contextualizing the oil companies of Arabic Saoudi. Furthermore, this research also adds to the available theory by also testing the contingent effects of social capital upon the association of open innovation and organizational performance of oil companies. The coming section of this paper is set as follows: in the proceeding section, the constructs utilized in the study and their relationship is explained, and hypotheses are developed under the heading literature review. After the literature review, the research methodology and data analysis methods are discussed. The contributions of the research, implication for the managers, and limitation of the research are discussed in the last section.

Literature Review and Hypotheses

Open innovation and organizational performance in the Oil industry

Open innovation and economic performance in the Oil industry

In the context of this research, the documentary analysis focused on existing studies in the field of organizational performance. The performance of companies in the oil sector depends on many factors. However, after a detailed review of the literature, it was observed that the performance of companies strongly depends on open innovation. Furthermore, it has also been discovered that to achieve maximum performance, social capital helps enhance the significant impact of open innovation. Performance measurement is essential, particularly in the case of oil companies, due to the informal maintenance of records (Asad et al., 2021; Majali et al., 2022). Thus, the measurement of business performance is based on the perceptions of owners and managers regarding the improvement of sales, assets, revenues, and employees (Androwis et al., 2018; Alzu'bi and Al-Jaghbeer, 2019; Asad et al., 2020; Haider et al., 2017).

Performance can also be considered a multidimensional construct that includes market share, market growth, profitability, asset and sales growth, and employment increase as the fundamental core of its dimensions. Forth and Bryson (2019) suggested that measures providing updated or innovative information to their managers, as well as to their owners, are considered an important tool for business management in the oil sector. Due to the rapid evolution of the business environment and the increasing technological complexity, companies must be proactive in open innovation. New knowledge can be acquired from external sources, and the innovation of products and services based on external knowledge is open innovation (Liao et al., 2019 ; Leckel et al., 2020). Open innovation, which can be easily achieved through

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collaboration between universities and industry, is lacking in developing countries, even though it could enable companies to acquire complementary knowledge (Tariq et al., 2022). Open innovation is an essential means for companies to gain the competitive advantage necessary to achieve high performance (Tariq et al., 2019). In this case, open innovation stimulates the creation of knowledge, thereby improving performance (Tariq et al., 2022). Open innovation allows companies to satisfy their customers, which impacts overall performance. However, for oil companies to achieve high performance, it may be desirable to implement open innovation through total quality to obtain superior performance, as inefficiencies are the main reasons for the time and financial costs that are considered a burden for oil sector companies that are already lacking resources (Majali et al., 2022). With regard to open innovation , Asad et al. (2021) assert that innovation significantly influences performance. In the aforementioned framework, we argue that the relationship between open innovation and performance, as well as social capital and performance, has been analyzed separately by previous researchers, but that the joint analysis of these two elements has a synergistic impact; Furthermore, the impact of open innovation and performance can be strengthened by adding the mediating role of social capital, which is not part of the firm's internal resources, as it relies heavily on external information. Thus, complementing RBV and social capital theory by adding to the body of knowledge exploring the mediating role of social capital, this study was conducted on oil companies in Saudi Arabia. We therefore formulate and test the following hypothesis:

H1.1. Open innovation has a positive effect on economic performance of Oil companies

Open Innovation and Operational Performance in Oil Companies

Although a lot of literature has been written about open innovation in big, international companies, the oil industry has received less attention. Furthermore, there has been a favorable tendency toward open innovation in this industry (Van de Vrande et al., 2009), and the participation of petroleumier enterprises in open innovation is growing (Brunswicker and Vanhaverbeke, 2015). Previous studies have generally shown that open innovation improves company performance. According to Vrgovic, P et al., et al. (2012), collaboration with external firms is associated with innovation performance. In the case of commercial enterprises, open innovation can be used to get over obstacles brought on by their scale. According to Jullien and Pénin, J. (2014) ,business model innovation can aid in overcoming organizational inertia and is favorably correlated with firm success. Research on open innovation in this industry is becoming more and more important due to the crucial role that oil companies play in the economy, both domestically and globally, and the growing significance of open innovation in these companies. Although there have been some research on the topic, the evidence is fairly little, out of date, and conflicting. For instance, Spithoven et al. (2013) speculate that open innovation has a different effect on firm performance for large versus small firms, but their Belgian data did not support this theory. Hung and Chiang (2009), on the other hand, demonstrated that a propensity for open innovation positively affects firm performance. Using the operating profit ratio as a performance metric,Lee et al. 2009) claimed that a closed innovation approach can improve performance, while (Kim et al.2008) discovered that not all open innovation initiatives had a favorable impact on business performance. This study found that SMEs might benefit from pursuing a closed innovation strategy, even though it only used a tiny data set. Although, (Andries and Faems ,2013) acknowledge in their research constraints that it is crucial to analyze patenting and licensing using more recent data, their analysis of patenting and company performance uses data from 2005 (Dahlander et al., 2021) recommend more research on SME open innovation activities in other nations as part of their study on the impact of open innovation on firm performance.

To compare various forms of open innovation and gauge their effectiveness, Usman M, et al., (2018) suggest a precise definition of open innovation parameters. Innovative concepts and technological know-how that enter a company's innovation system through inbound innovation allow it to acquire and match fresh external information with its own internal ideas (Vanhaverbeke W, 2017). It is the process of harnessing, utilizing, and enhancing technology through the integration and exploitation of outside information. A company can compete in the market and add value for customers by combining internal concepts with outside information. Cooperation with other businesses or academic institutions, involvement of R&D institutions in product development, involving customers or end users in product development activities, and obtaining intellectual property rights from outside organizations are all examples of inbound OI

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activities (Schenk E and Guittard C ,2016). In order to generate financial benefits, outbound innovation refers to the transfer of concepts and technological know-how from the organization where they are located to other businesses. Stated differently, the stakeholders are abusing their internal information. These activities entail the involvement of the corporation in new projects that are based on previously created items or on the advancement of technologies and products with outside assistance. The selling of patents, the granting of licenses, and the dissemination of ideas and knowledge to the external technology market are a few examples (Lou, Z.H. et al., 2022). Empirical findings about patent activities show a positive correlation between company performance and innovation behaviors as evaluated by patenting. According to the literature we have reviewed, we believe there is both a lack of research on the success of open innovation in oil sector companies and a lack of consensus. Although empirical evidence is scarce and contradictory, the authors hypothesize positive effects based on the access to resources made available to companies through open innovation. Open innovation offers multiple advantages to companies. Inbound OI allows a company to benefit from new ideas and combinations of knowledge, new market opportunities, and new problem-solving capabilities (Zhu, X.X. et al., 2019), "The fit between firms' open innovation and business model for new product development speed: a contingent perspective", Technovation, Vols 86-87, pp. 75-85.). At the same time, outbound OI allows companies to gain monetary and non-monetary benefits from leveraging their existing knowledge and technologies while minimizing the threats of obsolescence and remaining competitive (Moreno-Mond´ejar L et al., 2020). As suggested by the majority of previous studies regarding open innovation performance, most of them reveal a beneficial effect of open innovation on company performance (Zhang,S.H et al.,2020). Zhang, S., et al. (2018) provide empirical support for a positive effect of IO on R&D performance. Ahn JM (2020) shows that the success of new products is positively influenced by IO and that other works, IO practices have a positive and significant impact on company performance (Santoro G (2017). In contrast, De Zubielqui GC et al. show a negative effect of IO practices on performance, whereas Corral de Zubielqui G (2019) found that the breadth and depth of external search are curvilinear to performance. Thus, the literature has produced mixed results regarding the relationship between IO and company performance. Companies implementing open innovation strategies need to integrate internal innovators at the core (i.e., the R&D department), peripheral innovators on the inside, as well as external innovators in open innovation activities (Mei, N. et al. ,2019) to foster interaction within a heterogeneous group of individuals (Ahn JM, 2018). In order to establish adequate interaction channels, companies rely on a diverse set of open innovation instruments (Rangus K et al. 2013). Agramunt LF et al, (2020) study technology alliances and find that diversity in the alliance portfolio is positively related to innovative performance, which in turn promotes financial performance, at least or in the long term. Numerous studies have examined the effect of open innovation on businesses' financial performance. Dahlander and Gann (2007) contend that the adage "more openness is better" is untrue since achieving a high level of openness is not always simple and can be expensive. In fact, a company's choice of method should be based on how well it aligns with organizational, managerial, and strategic settings as well as how well it strikes a balance between costs and benefits.

H.1.2. Open innovation has a positive effect on operational performance in Oil companies

These two sub-hypotheses form our first research hypothesis (H1)

H.1. Open innovation is directly and positively related to the organizational performance of oil companies.

Open Innovation and Social Capital

The notion of social capital is generally described through enterprise norms and enterprise behavioral networks (Johnson, et al., 2019; Miković, et al., 2020). Social capital augments trust within the community as well as enterprises and its act a link among interior morality and norms (Abbas et al., 2019). Social capital contributes to the enterprises through formulation and establishment of association with several stakeholders and partners for the purpose of sustainability and social value creation (Johnson, et al., 2019). Precisely, social capital facilitates leaders in establishing relationships and social value by strengthening cooperation between employees, the government, the local community, and target users (Abas, et al., 2019).

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For the reason that social enterprises accumulate resources through relational possession with external components and that these relational possessions create added value that exceeds the transaction cost, social capital can enhance the social, economic, and environmental performance of social enterprises. Social capital helps companies strengthen their ability to improve cooperation for achieving performance. The argument above led to the formulation of the following hypothesis. In this research, it is expected that social capital plays a mediating role in the association between open innovation and the organizational performance of companies. It is clear from the discussions in the previous sections that social capital is supposed to have a positive association with organizational performance. It is therefore suggested that social capital mediates the relationship between social capital and the sustainable performance of social enterprises.

H.2. Open innovation has a positive and direct influence on social capital.

Social Capital and Organizational Performance

Organizational performance is defined as the alignment of financial and social objectives while operating core business activities to increase value maximization (Di Vaio & Varriale, 2020 ; Mousa and Othman, 2020). The concept of organizational performance is presented as a communication tool between the main components generally involved in economic balance at various levels of complexity of information domains (Johnson, et al., 2018). According to Mousa and Othman (2020), the increasing openness of the requirement for sustainable procedures in companies means that sustainability reports contain original values for those responsible for assessing the current financial situation of companies and forecasting their future performance (Di Vaio & Varriale, 2020). Organizational performance is the rearrangement of the two dimensions of performance, which are economic and operational performance (Berbegal-Mirabent et al., 2019). Economic performance includes the overall aspects of companies' economic exchanges, which contain the conventional indicators used in financial accounting, but also the intangible components that are generally not represented in financial terms (Di Vaio and Varriale, 2020). Organizational performance indicators can enhance the intangible resources of companies such as social capital, human capital, and image (Székely and Knirsch, 2005). The determinants of organizational performance are widely debated in the relevant body of knowledge. Ciemleja and Lace (2011) highlight the contribution of organizational knowledge resources to the enhancement of sustainable performance in social enterprises. Lazzarotti, V et al. (2017) established a link between the organizational performance of companies and the accumulation of knowledge acquired through relationships established by networks.

Chenhall, Hall, and Smith (2010) emphasized the decisive role of difficult-to-imitate knowledge resources, such as social capital, in improving the organizational performance of small and medium-sized enterprises. Miković et al. (2020) suggest that small and medium-sized enterprises focus on formulating new strategies to replace policies that negatively affect society and the community. There are a number of available factors that can be described as potential determinants of the sustainable performance of small and medium-sized enterprises. However, the existing problem is that a large number of surveys have highlighted the role of social capital and its development as a solid prerequisite for small and medium-sized enterprises, and Even though Bano et al. (2019) recently recognized the importance of intellectual capital for ensuring the survival of the business. The notion of social capital is generally described through the company's norms and the company's behavioral networks and social associations (Johnson, et al., 2017; Miković, et al., 2020). Social capital increases trust within the community as well as among businesses and acts as a link between internal morality and norms (Abbas et al., 2019). The social capital of SMEs contributes to businesses by formulating and establishing associations with various stakeholders and partners with a view to sustainability and the creation of social value (Johnson, et al., 2018). More specifically, social capital helps leaders establish relationships and economic value by strengthening cooperation between employees, the government, the local community, and target users (Abas, et al., 2019). For the reason that companies in the oil sector accumulate resources through relational possession with external components and that these relational possessions create added value that exceeds the transaction cost, social capital can increase the operational and economic performance of companies. Social capital helps companies strengthen their ability to improve cooperation for organizational development. The above argument led to the formulation of the following hypothesis.

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H.3. Social capital has a direct positive effect on organizational performance.

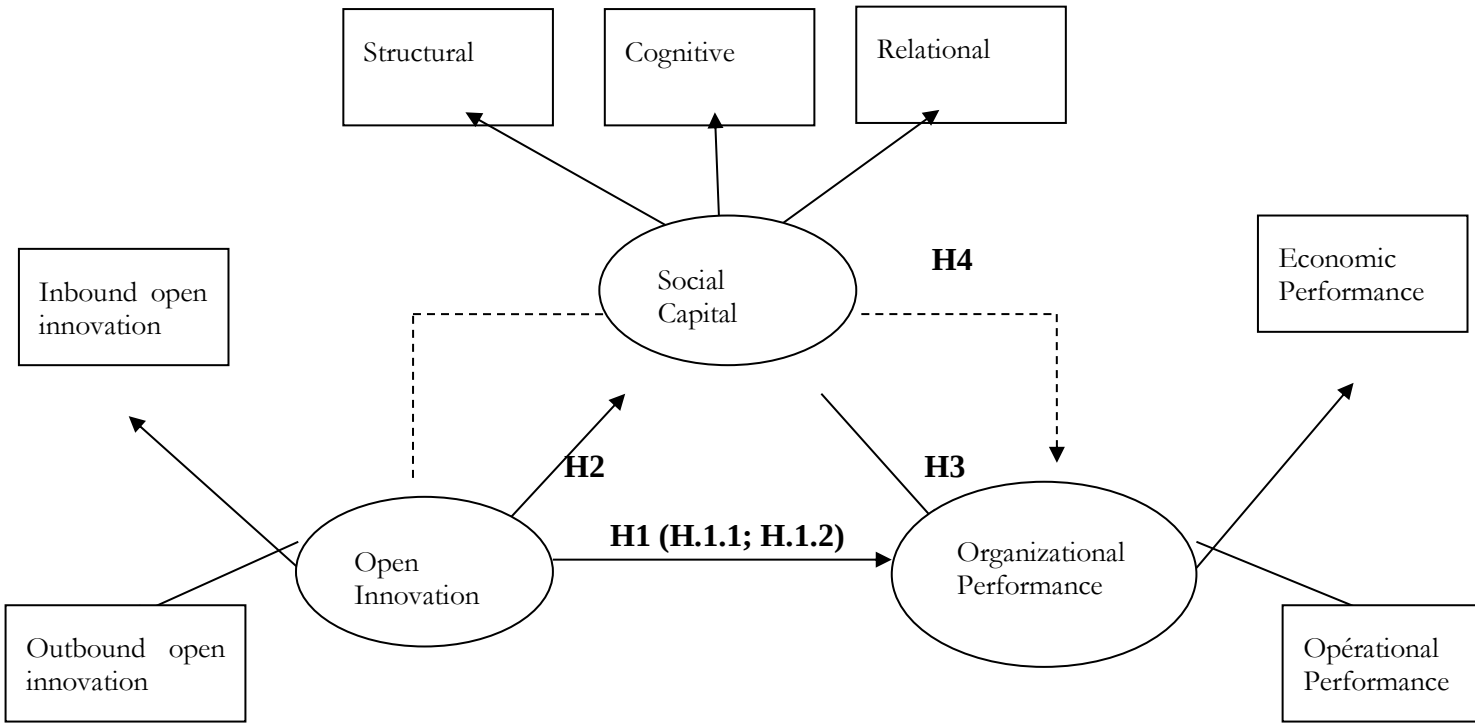
The Mediating Role of Social Capital

The implications of this document are obvious. Social capital plays an important role in various organizations and industries and has an impact in different ways. It should be noted that the majority of the articles have used the concepts of cognitive, relational, and structural capital to define social capital, which seems to be the preferred choice for measuring social capital. In each of the cited articles, calls for future research on social capital have been made. This conversation is noble and must continue if we want to understand and use social capital to advance our mutual understanding as individuals, as organizations, and as a global economy. As we move forward, social capital seems to increasingly become a medium of exchange, as it plays a mediating role between open innovation and organizational performance. The primary source of fresh information needed to start the inventive process inside social companies is social capital generated through networks (Gauthier, Cohen & Meyer, 2019). According to Singh (2016), small businesses should develop and implement plans and strategies to achieve better financial, social, and environmental outcomes. This will allow them to build up social value in a sustainable manner by acquiring knowledge resources such as social capital. It is expected that social capital will mediate the relationship between social capital and the organizational performance of small and medium-sized businesses.

H.4. Social capital mediates the association of open innovation and organizational performance.

This mediation hypothesis presupposes the existence of significant relationships between open innovation and social capital (H2), on the one hand, and between social capital and organizational performance (H3), on the other.

Figure 1. Conceptual Model



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Methods

Sample Size and Data Collection

The population included all oil companies active on the day the questionnaire was distributed (250 companies). The sampling method was probabilistic. In this context, a simple probabilistic sampling method was used, since the list of companies was available and the questionnaire was sent to all companies in the oil sector to be completed by their managers (members of the boards of directors). A paper version and an electronic version were offered to encourage participation in the survey. The questionnaire, accompanied by a covering letter detailing the research objectives, was distributed to the study's interviewees. The data collection process took place in two stages. In the first stage of data collection, a total of 250 questionnaires were sent out, of which 130 were returned, representing a response rate of 52%. In the second stage, we relaunched the questionnaire, adding a letter of motivation to participate in the survey. At the end of this stage, a total of 200 valid responses were recorded.

Measurement

Data collection for this study was carried out using a structured questionnaire. A 5-point Likert scale was used to measure the study concepts. The questionnaire was divided into two sections. To better understand the contextual aspects, respondents were asked about their own demographic profile and that of the company as control variables in the first section. The second section of the questionnaire contained the following statements on the study variables: open innovation, social capital and organizational performance.

Open Innovation

Open innovation is measured by two dimensions: inbound open innovation, which was measured by 9 items, and outbound open innovation, which was measured by 6 items. The scale was also used by Cheng and Shiu (2015); Naqshbandi (2016). All items were assessed on Likert-type scales with five response modalities, ranging from "disagree" to "strongly agree". The first variable is "incoming open innovation", a nine-item scale.

Social Capital

Three dimensions have been used to measure social capital: the structural dimension (four items), the relational dimension (five items), and the cognitive dimension (four items). All of the components were taken from earlier research by Subramaniam and Youndt (2005), which Khan et al. (2020) then used. This 13-item scale produced a Cronbach's alpha value of 0.761.

Organizational Performance

To measure organizational performance, the items were inspired by Huo, (2012); Maletic et al. (2015). This scale comprises two variables, namely economic performance, which comprises 3 items, and operational performance, which comprises 10 items. The 13 items scale generated Cronbach alpha value of 0.894.

Variables of Control

This study used enterprise size and age as control variables to have a better grasp of the contextual aspects.

Data Analysis

The analysis of results using structural equations is based on the true-measurement model of Everard et al (1993), according to which: true measurement=obtained measurement+ random error +systematic error. Reliability tests reduce the first error and validity tests reduce the second error. We therefore first examine

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the fit of the measurement model to the data. Thus the coefficient of determination R2, which reflects the explanatory power of our independent variables. Hair et al (2018) recommend that a quality model estimated by the PLS method should haveR2 coefficients of determination that exceed 0.2 (20%). We also examine the predictive power of the model through Q2 predictive validity analysis. If Stone Geisser's Q2 index is positive and non-zero, the model has good predictive validity (Fernandes, 2012). In this step we also check multicollinearity by the VIF test, which must be less than 5 or even 3 (kock, 2015). In the measurement model provided by smart PLS 4, reliability is measured by Cronbach's alpha and Composite Reliability (CR) (> 0.7; Hair et al, 2028).Concerning, model validity, Fornell and Larker (1981) consider that an instrument is valid if it satisfies both types of validity: convergent validity and discriminant validity.

Convergent validity exists when the avearage variance extraxted (AVE) between items and their construct is greater than 0.5.

There is discriminant validity if the square root of the AVE of each construct subject to discrimination exceeds its correlations with the other constructs (Chin ,2010).

Secondly, we move on to the structure model to test our research hypotheses. Thus, the regression coefficients must be positive (>0) and significant (P-value<0.05) (Hair and al, 2018). The same applies to indirect mediating relationships, but at this stage we add the interpretation of Lower band and Upper band confidence intervals for the mediating effect of "social capital". These intervals are provided directly by the bootstrap procedure on PLS 4. The confidence intervals for the indirect effect must not contain zero. Finally, to test the extent of mediation, we compare the indirect effect with the direct effect (Baron and Kenny, 1986; Bennaceur and Chafik (2019). If the direct effect of the independent variable "open innovation" on the dependent variable "organizational performance" (H1) cancels out in the presence of the mediator "social capital" (H4), mediation is perfect, but if it weakens but remains significant, mediation is said to be partial.

Measurement Model

During exploratory analysis, Outbound 4, Outbound 5 and Outbound 6 items were eliminated for their low factor weights (<0.7). After this purification, all loadings are significant (P<0.05) and greater than 0.7 (Hair and al, 2013) (see figure.1). We also note that the variables: age and company size do not influence the two dimensions of the "organizational performance" dependent variable: "economic performance" and "operational performance". Thus, these two variables are not control variables in this model.

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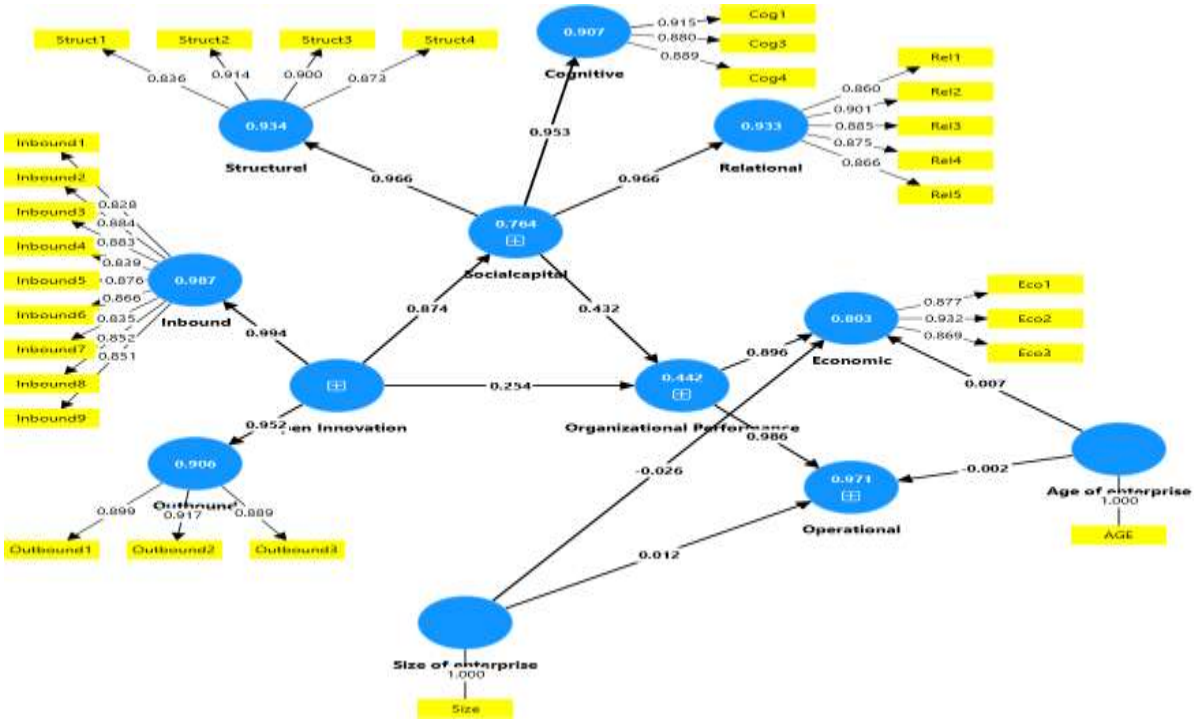
Fig.1. Measurement Model



Correlations Between Latent Variables

We note the existence of strong correlations (>0.6) between the latent constructs and their first-order variables. For example, the correlations between "open innovation" and its two dimensions (inbound/outbound) are 0.994 and 0.952 respectively. The same applies to the correlations between "organizational performance" and its economic (r= 0.896) and operational (r=0.986) aspects. The same is true for "social capital" with its three components (cognitive r=0.953); (relational r= 0.966) and (structural r =0.916). In such statistical conditions, where the correlations between latent constructs and their initial dimensions are significant (>0.6), authors such as Roussel and El Akremi (2002) recommend the use of second-order analysis, considering constructs as generic constructs with a high level of abstraction, resulting in the aggregation of their components. Thus, we are interested in the global relationships between our three generic constructs: open innovation, social capital and organizational performance, rather than first-order relationships.

Table.1. Correlations Between First-Order Variables and Justification of The Second-Order Model

	AGE	**Cognitive**	**Economic**	**Inbound**	**Open Innovation**	**Operational**	**Orga-Perfo**	**Outbound**	**Relational**	**Size**	**Socialcapital**	**Structurel**
Open Innovation	0.208	0.826	0.599	**0.994**	1.000	0.608	0.631	**0.952**	0.831	-0.190	0.874	0.867
Organizational	0.056	0.613	**0.896**	0.625	0.631	**0.986**	1.000	0.605	0.640	0.022	0.654	0.630

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Performance												
Socialcapital	0.214	**0.953**	0.635	0.869	0.814	0.625	0.654	0.831	**0.966**	-0.200	1.000	**0.916**
AGE	1.000	0.198	0.066	0.206	0.208	0.050	0.056	0.198	0.218	-0.887	0.214	0.200
Size	-0.887	-0.206	0.004	-0.190	-0.190	0.028	0.022	-0.177	-0.191	1.000	-0.200	-0.181

Table.2. Explanatory And Predictive Power of the Model (Endogenous Variable)

	R-square>20%	Q^2 Predict>0
Organizational Performance	0.442	0.391

We note that the R2 coefficients of the endogenous variable exceed 0.20 (Hair and al, 2017) and the Q2 is positive and greater than 0.35 which attest to the explanatory and predictive strength of the independent variables "Open innovations inbound/outbound" and "cognitive/structural/relational social capital" on the dependent variable "organizational performance" with its two components "economic" and "operational".

Table.3. Multi-Colinearity Test (VIF)

	VIF<5
Open innovation -> Organizational Performance	4.277
Open innovation -> Socialcapital	1.000
Social capital -> Organizational Performance	4.237

We note that all the tests are below 5, attesting to the absence of collinearity between our latent variables and the absence of serious social desirability bias (kock, 2015).

Reliability and Convergent Validity

The exploratory (Cronbach's alpha) and confirmatory (Composite reliability) reliability tests are all conclusive, given that they exceed the recommended threshold of 0.7 (Hail and all, 2013). Similarly, the average shared variance (AVE) scores are all above 0.5 (Fornell and Larker, 1981) (see Tab.4).

Table.4. Reliability and Convergent Validity

	Cronbach's alpha	Composite reliability (rho_c)	Average variance extracted (AVE)
Open innovation	0.966	0.970	0.728
Organizational Performance	0.948	0.955	0.619
Socialcapital	0.967	0.971	0.719

Discriminant Validity

The statistics on the diagonal of Table 5 show that all AVE square roots are greater than inter-construct correlations. As a result, the constructs open innovation, social capital and organizational performance have good discriminant validity (Fornell and Larker, 1981).

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Table.5. Discriminant Validity

	Open-innov	**Organizational Performance**	**Social capital**
Open innovation	***0.854***		
Organizational Performance	0.631*	***0.786***	
Socialcapital	0.814*	0.654*	***0.848***

Racine carré de l'AVE ; Corrélations bilatérales*

At the end of these analyses, we can affirm that the measurement model built around the three second-order constructs is reliable and valid.

Testing Hypotheses

Our structural model comprises four hypotheses. The first three hypotheses stipulate the existence of direct relationships between open innovation and organizational performance (H1), between open innovation and social capital (H2) and between social capital and organizational performance (H3). The fourth hypothesis states the possibility of an indirect relationship between open innovation and organizational performance through the mediating role of social capital (H4). Before proceeding with the causal analysis, we first check for common method bias.

Common Method Bias Test

The information on the independent and dependent variables was collected from the same individuals, which could produce, in the sense of Podsakoff et al (2003), a social desirability bias statistically called common variance or common method bias. This sampling bias is rendered to the phenomenon of variance inflation. To reduce this statistical bias, we performed Harman's single factor test on SPSS software. We grouped all the variables of the three constructs (Open innovation, social capital and organizational performance) into a single factor, and the variance returned should not exceed 50%. In fact, this single factor was only able to restore 23.174% of the initial variance, which is below the 50% threshold recommended by Harman. So the common variance bias in our database is not serious.

Tests of Direct Hypotheses (H1, H2, H3)

From the statistics in Table.6, we note that the structural coefficients (original sample) are positive and significant ($p<0.05$), allowing us to confirm the first three hypotheses, which stipulate the existence of direct relationships between open innovation and organizational performance (H1) with its two sub-hypotheses (H.1.1 open innovation and economic performance and H.1.2 open innovation and operational performance), open innovation and social capital (H2) and between social capital and organizational performance (H3).

Table.6. Direct Effects

	Original Sample	**Standard deviation**	**T statistics**	**P values**	**Décision**

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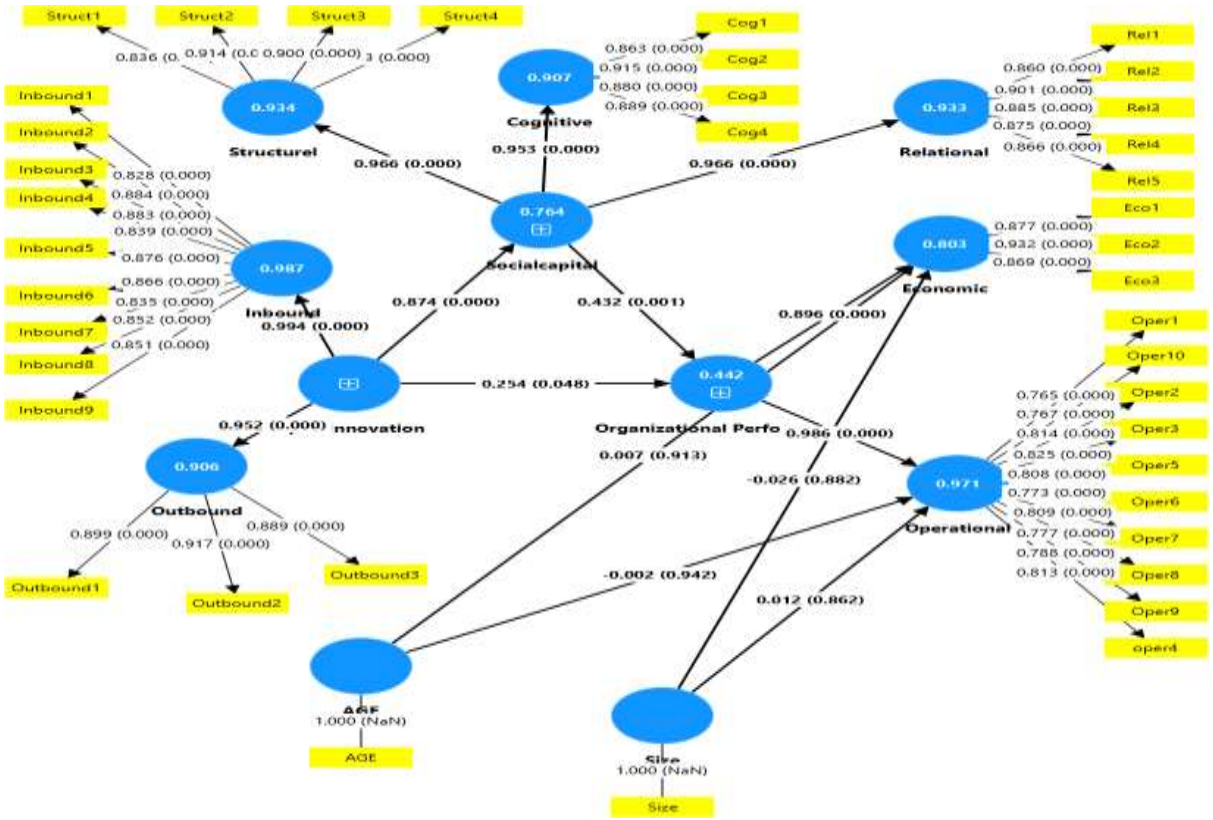
Open Innovation -> Organizational Performance (H1)	0.254	0.128	1.979	0.048	***Supported***
Open innovation-> economic performance (H.1-1)	0.565	0.059	9.575	0.000	***Supported***
Open innovation-> operational performance (H.1-2)	0.622	0.063	9.909	0.000	***Supported***
Open Innovation -> Socialcapital (H2)	0.874	0.032	27.318	0.000	***Supported***
Socialcapital -> Organizational Performance (H3)	0.432	0.127	3.394	0.001	***Supported***

Figure 2. Structure Model (Bootstrap=5000 Iterations)



Testing Indirect Relationships: The Mediating Effect of "Social Capital".

According to Preacher and Hayes (2008), the mediator effect is established if two conditions are met: The bootstrap of the total effect linking the independent variable (open innovation) to the dependent variable (organizational performance) must be significant (P<0.05).The indirect effect of social capital must also be significant by examining the confidence intervals (lower and upper bounds) of the Bootstrap. Zero (0) must be excluded from the intervals. The first condition is already verified in the total effect test linking the independent variable to the dependent variable (T=10.005; P=0.000) (See Table.8).The second step is also

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verified in the statistics in Table 7. Thus we report that the structural coefficient of the indirect link is 0.378 and P=0.001<0.05 and both bootstrap bounds do not contain zero (Lower band=0.175 and Upper Band= 0.634). Thus hypothesis H.4 that social capital mediates the relationship between open innovation and organizational performance is confirmed. We can conclude that open innovation has a double positive effect on organizational performance. A direct effect (H.1) and an indirect effect through social capital (H.4).

Table.7. Specific Indirect Effect

	Original sample	**Standard deviation**	**T statistics**	**P values**	**Confidence Intervals**		**Decison**
					LB 2.5%	**UB 97.5%**	
Open Innovation -> Social capital -> Organizational Performance (H.4)	0.378	0.117	3.232	0.001	0.175	0.634	***Supported***

Table (8) shows the extent and nature of this mediation. We thus check whether the initial total effect (direct+indirect) of open innovation on organizational performance without mediation cancels out in the presence of the mediator (social capital) or remains significant. If it cancels out and becomes insignificant, mediation is total. If it remains significant, mediation is partial. In our case, the total effect decreases (from 0.631 to 0.254) but remains significant (P=0.048<0.05), so mediation is partial. The extent of this partial mediation is calculated by taking the share of the indirect effect in the total effect (indirect effect (0.378)/total effect (0.631)=0.599). Summing up these analyses, we can report that social capital mediates almost 60% of the relationship between open innovation and organizational performance in the Oil companies studied here.

Table.8 Type and Extent of Mediation

Effects/médiation	**Original sample**	**Standard deviation**	**T statistics**	**P values**
Total effect Open Innovation -> Organizational Performance	0.631	0.063	10.005	0.000
Direct Effect Open Innovation -> Organizational Performance	0.254	0.128	1.979	0.048
Indirect Effect Open Innovation ->Social capital ->Organizational Performance	0.378	0.117	3.232	0.001
Type and Extent of Mediation	Indirect effect/ Total effect= 0.378/0.631=**60%** **Partial médiation**			

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Discussion

The main objective of this research was to assess the extent to which open innovation affects the organizational performance of small and medium-sized enterprises in the Saudi Arabian oil sector. In addition, the effects of open innovation on the economic and operational performance and the effects of social capital on the organizational performance of small medium-sized enterprises were also assessed. In addition, the contingent effects of social capital on the relationship between open innovation and firm organizational performance were also verified. Based on detailed literature reviews, this research developed a total of four hypotheses to approve the direct and indirect effects of open innovation. The results of the statistical analysis confirmed all the study's hypotheses. First, the H1 hypothesis of the study was confirmed, as the study approved the direct relationship between open innovation and the organizational performance of small and medium-sized enterprises. The results of the present study are consistent with the findings of the research by Bianchi et al., (2016); Chesbrough and Crowther, (2006); Popa et al.,(2017). Hannigan et al. (2018) and the existing study, in accordance with the resource-based view of the firm, also highlight the importance of open innovation in enhancing the economic and operational performance of small and medium-sized enterprises. Regarding the second hypothesis H2, which addresses the effect of open innovation, the statistical results also confirm that open innovation positively contributes to social capital. The results are consistent with the works of Gao et al. (2019) and Widjaja et al. (2023). Regarding point H3 of the study, the statistical results also confirm that social capital positively contributes to organizational performance. This research conclusion is consistent with the findings of Ying et al. (2019), Yusliza et al. (2020), and Abas et al. (2019). In relation to H4 of the study, the mediating effects of social capital in the relationship between open innovation and organizational performance are also confirmed. This conclusion of the current study is consistent with the results of El Maalouf & Bahemia, 2023.

Theoretical Contribution

First, this research includes a tested statistical model that emphasizes the importance of open innovation in enhancing the economic and operational performance of SMEs in the Saudi oil sector. The importance of open innovation has been significantly highlighted. Le degré auquel l'innovation ouverte influence l'innovation dans les produits, les services et les processus ; les PME doivent prendre en compte le flux de connaissances pour fournir des capacités qui se traduisent par une amélioration de la performance commerciale. De plus, des recherches antérieures ont montré que l'innovation ouverte est un prédicteur majeur de l'adoption de l'innovation, en particulier pour les PME dans les pays pauvres. (Mina et al., 2014; Prabowo et al., 2020; Tsinopoulos et al., 2017). Secondly, although some research has emphasized the role of social networks and intellectual capital in enhancing sustainable performance, the combination of open innovation and social capital with the organizational performance of small and medium-sized enterprises has never been evaluated before (Di Domenico, et al., 2010). Thirdly, this research emphasizes the importance of social capital and evaluates its mediating role in the association between psychological capital and the organizational performance of small and medium-sized enterprises.

Managerial Implications

In addition to adding to the existing body of knowledge, this study also offers valuable implications for managers of small and medium-sized enterprises. First of all, the current research recommends that managers and decision-makers of small and medium enterprises pay particular attention to the development of open innovation and consider it an imperative characteristic for strategic management and planning.The research will be useful for policy development in Saudi Arabia by helping SMEs enhance their capabilities through adopting innovation. Moreover, this study highlights the open innovation ecosystem based on an evaluation of the Global Innovation Index. (2019). The index shows that this ecosystem is still small. The study also provides an overview of open innovation in SMEs in Saudi Arabia, thus helping decision-makers to pay more attention to this aspect. For SME owners and managers, it is important to explore, and the importance of social capital cannot be ignored by small and medium-sized enterprises, as the accumulation of social capital has become a solid antecedent for the organizational performance of small and medium-sized enterprises. (Annen, 2003). Secondly, this study also recommends that social capital strengthens the

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relationship between open innovation and organizational performance to benefit both society and the company. Thus, to improve the creation of economic value, the increase and accumulation of social capital should be integrated as a privileged component in long-term planning and management. Finally, this research also recommends that SME managers focus on open innovation, which primarily allows social enterprises to improve their operational and economic performance so that these companies can effectively contribute to the sustainable development of society. By applying open innovation, SMEs will be in a better position to improve their organizational performance (Ruiz-Palomino, P., and Zoghbi-Manrique de Lara, P. (2020)).

Limitation of the Study

Several limitations of this study need to be addressed in future research. First of all, this research used the single informant technique and the data were collected from small and medium-sized enterprises in the oil sector. As a result, the findings of this study may be subject to the issue of CMV. (common method variance). This study addressed this issue using a test suggested by Podsakoff et al. (2003). The result indicated that the findings of the present study are probably not due to CMV. But for future research, it is recommended to collect data using the multiple informants technique to eliminate the similar problem. The second limitation of this research is the generalization of the results. As the results of this study are limited, due to the fact that in this study, the data were collected from SMEs in the Saudi area. For future research, it is recommended that a significant addition would be to test this model in other economies, or to conduct comparative studies between developed and developing economies. Moreover, the cross-sectional research design does not allow for causal interpretations between multiple components, thus this research cannot suggest when the components of social capital are imperative for organizational performance.

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