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The relationship between environmental scanning and organizational resilience: Roles of process innovation and environmental uncertainty

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Due to increased global environment volatility and uncertainty, organizations are constantly faced with unexpected events such as the COVID-19 pandemic, which has brought large international disruptions for several firms. Organizational resilience is a potential notion for describing how firms might stay alive and thrive in such a volatile environment. Therefore, this study aimed to examine how SMEs can foster their resilience through investigating the roles of environmental scanning and process innovation while testing the moderating role of environmental uncertainty. To achieve this aim, we tested a structural model through an empirical investigation with partial least squares structural equation modelling (PLS-SEM) using a sample of 249 Egyptian SMEs. The results reveal that process innovation is a necessary condition for environmental scanning to affect organizational resilience. Furthermore, the results do not support the moderating role of environmental uncertainty the indirect relationship between environmental scanning and organizational resilience. Our findings contribute to innovation and resilience literature by proving that process innovation is a necessary mechanism to translate environmental scanning information to enhance resilience. This research is the first to highlight the role of process innovation in linking environmental scanning to organizational resilience. Our results provide insights about how Egyptian SMEs could remain resilient amidst the COVID-19 through scanning their environments to improve internal processes. We discuss related theoretical and managerial implications.

KEYWORDS

environmental scanning, process innovation, organizational resilience, environmental uncertainty, organizational information processing theory (OIPT), Egyptian SMEs

1 Introduction

Change, environment variability, unpredictability, and destabilization are the only constants in this ever-changing economic world; hence, global turbulence is a constant phenomenon (Uche and Accra, 2015). In these highly chaotic and unpredictable environments, organizations constantly face unforeseen occurrences such as the COVID-19 pandemic that has caused significant global supply and demand disruptions in many enterprises, resulting in huge financial losses ((Duchek, 2020; Gu et al., 2021). The COVID-19 epidemic and the resulting economic lockdown shocked global businesses and economy. Despite the fact that conditions vary across business sectors and countries throughout the prolonged uncertainty, the unifying goal for businesses is to respond effectively, design plans to survive the crisis and expedite recovery (Bhattacharyya and Thakre, 2021).

The COVID-19 epidemic has had a significant negative impact on businesses and the public. The pandemic has grown to be the major challenge and has affected every community (Yu et al., 2022). Various firms have experienced numerous health and operational issues as a result of COVID-19 (Aman et al., 2022; Ge et al., 2022; Rahmat et al., 2022; Yu et al., 2022). These difficulties pertain to losses brought on by lost customers and supply chain interruptions (Moradi et al., 2021; Zhou et al., 2021; Aqeel et al., 2022). Businesses have experienced issues like health issues, changes in international and export orders, and a shortage of raw materials (Aqeel et al., 2021; Paulson et al., 2021; Li et al., 2022a).

In order to survive the COVID-19 pandemic and succeed in this turbulent environment, the traditional techniques and approaches of management are becoming restricted in their ability to handle such unpredictable and fast changing environment (Haarhaus and Liening, 2020). Instead, the literature provides a number of additional recommendations for how businesses can face future environmental uncertainties. In this regard, organizations can survive through resisting, absorbing, and responding to disruptive occurrences through organizational resilience. Organizational resilience is a potential notion for understanding how organizations might survive and grow in the presence of environmental challenges. Organizational resilience effectively enables businesses to cope with challenging conditions (Li et al., 2022b). Resilient organizations can bounce back in the face of disruptions and resume their pre-event position (Hillmann and Guenther, 2021). McCann et al. (2009), define organizational resilience as "the capacity for resisting, absorbing and responding, even reinventing if required, in response to fast and/or disruptive change that cannot be avoided," p.45.

Scholars began to focus on ways to promote organizational resilience because of its relevance for organisations to survive in unpredictable settings. Various variables may contribute to building SMEs' organizational resilience. However, research findings are largely inconclusive (Saad et al., 2021). Generally, innovation is significant to the long-term success and growth of most enterprises (Awan and Sroufe, 2022). The change process that occurs through innovation is significant for SMEs since it involves updating the existing business models (Awan and Sroufe, 2022). In this vein, Chaharbaghi et al. (2005) asserted that organizational resilience is based on the firm's ability to transform its way of doing business in a way that matches the demands of its environment. Changing, transforming, and improving internal processes through process innovation is critical for an organization's survival (O'Regan and Ghobadian, 2011). Resilient organisations have to modify their business processes to match their efficiency and effectiveness (Li-Hua, 2007).

Additionally, to survive and succeed in today's volatile business environment, businesses must routinely monitor environmental signals and cope with such uncertainties (Majid and Kowtha, 2008). Amidst Covid-19 pandemic, people and organizations started to seek more related information via several sources (e.g., social media platforms) to detect the perceived risks that businesses are going to confront in order to minimize the negative effects on their operations and improve their survival (NeJhaddadgar et al., 2020). In this regard, environmental scanning which is defined by Aguilar (1967) as "the way in which management gathers relevant information about events occurring outside the company in order to guide the company's future course of action" is considered a vital tool, p. 1. Environmental scanning provides top managers information about technological advancements, governmental regulations, customer needs, supplier conditions and external economic trends (Yu et al., 2019).

Although SMEs are often viewed as a fruitful source of innovative ideas and perspectives, the knowledge and information needed as inputs to achieve innovation are beyond a single firm's capability. In this vein, SMEs tend to obtain the required resources for innovation from the environment (Awan and Sroufe, 2020). In addition to internal R&D to create knowledge, the sources of knowledge outside the enterprises have been proven to affect process innovation (Awan et al., 2020). For example, Forés and Camison (2016) reached that the innovation performance of a firm depends on external and internal sources of knowledge to reduce the impact of the environment. Similarly, Awan and Sroufe, (2020) asserted that gaining external knowledge significantly influences innovation and that developing knowledge capabilities can lead to developing new processes. That is the reason why SMEs started to concentrate on scanning their environments to get the information necessary to achieve innovation because environmental scanning enables them to be alert and sensitive to environmental changes, making it easier to identify and utilize opportunities for innovation (Grimpe and Sofka, 2009).

Some previous studies has examined or at least encouraged to examine the impact of ES on OR and highlighted the importance

of information to reduce uncertainty and increase adaptation such as the study of Burnard et al. (2018), and more recently the study of Vakilzadeh and Haase (2021). Yet, the links between environmental scanning and organizational resilience remain unclear. Therefore, to fill this gap, we argue that facing a crisis through organizational resilience supported by accurate information obtained through environmental scanning can help organizations stay in the face of disruptions. Therefore, we argue that regular environmental scanning can have a direct positive impact on organizational resilience.

Although we argued that environmental scanning can directly influence building organizational resilience, emerging research recommends that the quicker reaction to information about the external environment over rivals and not environmental scanning signals is what contributes to survival (Hambrick, 1982). Further, according to the Organizational Information Processing Theory (OIPT), managing unpredictability via acquiring, integrating and disseminating information from the external environment is the major mission of an organization's design (Daft and Weick, 1984; Gattiker and Goodhue, 2004). OIPT is vital in understanding the different techniques used to process information to deal with diversities of the business environments (Flynn and Flynn, 1999). However, incorporating OIPT into explaining how some variables can affect resilience has not been researched until now. The OIPT contends that, organizations should increase their information-processing capacities in accordance with increases in uncertainty to fit with information needs (Daft and Lengel, 1986). Therefore, we consider environmental scanning as a tool for gathering information that can help organizations to face uncertainty with more resiliency. However, in order to use the information gathered through environmental scanning in building resilience, and according to the OIPT, it is important to translate such information into more improved internal processes, production methods and management approaches that help in building a more resilient organization. Moreover, although the study of YhaiaMarzouk and Jin (2022) empirically proved that ES influences OR, it did not clarify the mechanism through which environmental information can be seized to transform current business processes to achieve resilience. Therefore, there should be a mediator, such as process innovation, to translate the signals obtained through environmental scanning in order that organizations could be able to respond to the environmental changes (Yu et al., 2019). We, therefore, believe that building organizational resilience is a three-step process that starts with scanning then analyzing and restructuring inner organizational connections/processes through process innovation in order to finally build differentiators and survive through being more resilient.

Moreover, an organization's ability of processing knowledge and integrating it within existing dynamics to adjust its conduct and enhance performance is a way to build resilience (Valaei et al., 2017). Aulia and Soetjipto (2021) emphasized the necessity of generating new knowledge throughout the adaptability processes of the organization, in order to motivate the formation of novel working routines and processes. Hence, in order to adapt and become resilient, organizations must first create and acquire the knowledge that is relevant for changing current routines and working processes. Hence, in order to adapt and become resilient, organizations must first create and acquire the knowledge that is relevant for changing current routines and working processes. Accordingly, we fill the literature gap within the field of OR by arguing that organizational resilience require collecting information about current trends and events, then change the internal processes according to the current state of the environment, hence the organization becomes more resilient in the face of external disruptions.

Therefore, the current research argues that environmental scanning can indirectly affect organizational resilience through the mediation of process innovation. No study has attempted to unearth the link between environmental scanning and organizational resilience through the mediation of process innovation. Therefore, the current study will fill this knowledge gap by testing the mediation of process innovation in the environmental scanning-organizational resilience relationship within the developing market context of Egypt via the OIPT lens. The current study, therefore, contributes to the organizational resilience literature by demonstrating how process innovation can interpret environmental scanning signs in order to build organizational resilience.

Besides, the degree with which higher degree of environmental scanning leads to increased resilience can depend on the degree of environmental uncertainty. This is mainly because environmental scanning is especially useful in highly uncertain situations and it fosters organizations' capabilities to determine new opportunities and threats and enable them to adapt with more flexibility to their changing environments (Cornelius et al., 2005; Vecchiato, 2015). Similarly, within volatile contexts, organizations seek novel ideas and generate new expertise, particularly to stay up with new technological advancements (Wu and Shanley, 2009). Therefore, environmental turbulence may increase the effect of environmental scanning on organizational resilience. Accordingly, our study will also explore the moderating role of environmental uncertainty in the indirect relationship between environmental scanning and organizational resilience through process innovation.

To sum up, our current research contributes to the extant literature of organizational resilience by investigating how environmental scanning and process innovation can affect it by incorporating OIPT for explaining such relationship as one of the first endeavors to use such theory in the topic of organizational resilience. Second, our research investigates whether this relationship is moderated by the level of environmental uncertainty. Third, our current research

contributes to the research about resilience by investigating its relationships within the developing country context of Egyptian SME during the COVID-19 pandemic. As a result, findings of this study will help to develop a wider picture as to how African SMEs might adapt to the COVID-19 pandemic, thereby, helping policymakers devise more suitable mechanisms to understand and improve OR while guiding related studies in other country contexts.

2 Literature review and hypotheses development

2.1 Key concepts and theories

2.1.1 Environmental Scanning

Aguilar (1967) conducted the first important study regarding the topic of environmental scanning, which he defined as "the way in which management gathers relevant information about events occurring outside the company in order to guide the company's future course of action" (p. 1). Environmental scanning according to Lester and Waters (1989), is a management tool that employs environmental information to enhance decision-making *via* the acquisition, analysis and usage of information.

Environmental scanning is a strategic foresight method. The goal of strategic foresight is reduce the unknown domain and account for uncertain decision-making processes (Ratcliffe, 2006). Strategic foresight methods, including environmental scanning, make organizations aware of their environments and enable them to properly seek and seize opportunities that are neglected by rivals in highly volatile contexts (Sarpong and Maclean, 2011). Besides, studies have shown that some organizations use strategic foresight methods in order to increase their innovation capacities and resilience against external disruptive changes (Madjdi and Huesig, 2011).

Because of the quick shifts occurring within the current marketplace, it is more probable for an enterprise to lag behind if it does not obtain updated information on external environmental events (Albright, 2004). In this regard, environmental scanning has become an important concept in management literature to handle environmental uncertainties (Bhardwaj and Kumar, 2014). Organizations engage in environmental scanning to comprehend the external change forces, therefore, that they can generate appropriate responses that secure and enhance their position in the future. Additionally, environmental scanning helps organizations in avoiding surprises, detecting risks and opportunities, obtaining a competitive advantage, and improving short and long-term planning (Bhardwaj and Kumar, 2014).

2.1.2 Process Innovation

Process innovation refers to innovations in how the organization excutes its business, such as the production or marketing techniques, or novel internal processes (Zhuang et al., 1999). More specifically, process innovation involves introducing novel and improved methods of production or of delivering goods and/or services by an organization that include considerable modifications in processes, equipment, tools, machinery, and so on (Union, 2013). Process innovation is able to transform an organization's way of conducting business via generating or marketing goods and/or services differently (Schilling, 2010). Process innovation simply means innovation in technologies of processes, skills and methods, organizational systems, and managerial procedures involved in the transformation of inputs into outputs (Zhuang et al., 1999). Process innovation involves new production methods introduced as a result of increased efficiency resulting from cost reductions (Pinto et al., 2019).

Generally, innovation plays an important role during crises times. In order to effectively manage crises such as the COVID-19 pandemic, business managers and decision-makers must use rational, practical, and innovative skills and business plans (Li X. et al., 2022).

In general, depending on the researcher's interest, organizational innovation can be measured in a variety of ways. Researchers who are interested in market performance can concentrate on product, market, and technological innovation (Wang and Ahmed, 2004; OECD, 2005), whereas those who are interested in organizational innovation per se can measure innovation through process, structural, and competence innovation (Wang and Ahmed, 2004; OECD, 2005). These dimensions are more vital in building an organization's adaptive capability to absorb shocks (Mafabi et al., 2015). Process innovation involves introducing new methods of production, management approaches, and technologies that are used to improve the processes of production and management. Process innovation is essential for overall innovation capability since an organization's capacity to seize its resources and capabilities, and most importantly, the ability to recombine and revamp its resources and capabilities to meet the creative production requirements is vital to its success (Wang and Ahmed, 2004).

2.1.3 Organizational Resilience

Organizational resilience comes from the Latin word "resilire," which means, "to bounce back" (Klein et al., 2003). Holling (1973) first defined resilience in the field of ecology as "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables" (p. 17). Following that, organizational resilience publications become interdisciplinary, ranging from natural sciences, including

ecology and engineering management, to social sciences, including economics, organizations' management, strategic management, and supply chains, and multi-level, ranging from nations and organizations to individuals (Saad et al., 2021).

Meyer and Rowan (1977) first introduced organizational resilience into the research field of organizational management. Kantur and Iseri-Say (2012; 763) defined OR as "an organization's capability for turning adverse conditions into an organizational opportunity, positive attitude of "bouncing back" and a relatively agile deportment." Similarly, Hillmann and Guenther (2021, p.31) defined organizational resilience as "the ability of an organization to maintain functions and recover fast from adversity by mobilizing and accessing the resources needed." Although scholars have not yet reached an agreement on defining organizational resilience, most agree that it is the ability of organizations to successfully absorb, adapt to, and ultimately capitalize on disruptive events that may endanger their survival (Williams et al., 2017).

During turbulent times, OR is a key factor for organizations' success since it allows them to adapt to different types of disruptions from adverse events to global crises (McCann et al., 2009). Organizations should constantly pursue organizational resilience to deal with the ongoing pressures of the environment. However, determining the main factors and coupling practices and resources that promote organizational resilience are still challenging for SMEs (Sanchez-Garcıa et al., 2020). Therefore, the management literature is increasingly focusing on studying and finding out which systems or practices are necessary for organizations to be more resilient (Lai et al., 2016).

Organizational resilience can have a long-term positive impact on the organization because resilient organizations can survive and prosper in an increasingly changing, complicated, and unpredictable environment (Näswall et al., 2013). Similarly, organizational resilience is a key concept in explaining why some organizations outperform others (Kantur and İşeri-Say, 2012).

Despite the increasing interest in organizational resilience and the various dimensions produced by various authors for it, there is not universally agreed upon measure of it (Kantur and Iseri-Say, 2015). Generally, organizational resilience concept is widely used in organizational studies and strategic management research. Although the theoretical and qualitative studies are progressing, quantitative studies are moving at a slower pace. This is owing to the lack of a reliable and valid scale in the literature (Vogus and Sutcliffe, 2007). Accordingly, this study will depend on Kantur and Iseri-Say's (2015) scale of organizational resilience. This scale assesses the degree of resilience in the organization rather than the degree of the presence of the factors contributing to it. Therefore, the dimensions of organizational resilience according to Kantur and Iseri-Say (2015) are robustness, which measures an organization's ability to withstand and recover from adverse circumstances; agility, which measures an organization's capability to act rapidly; and integrity, which evaluates the cohesiveness among organizational members.

2.1.4 Environmental Uncertainty

Environmental uncertainty is the difficulty of rationally bounded managers to completly acquire, interpret, and comprehend information about the external environment because of the environment's instability and ambiguity (Vecchiato, 2012). As a result, if business decision makers in charge of the organization's future development are unable to precisely predict how the environment will evolve, the environment can be regarded unpredictable. (Milliken, 1987; Vecchiato, 2012). Environmental uncertainty relates to the difficulty of making decisions in the absence of relevant information and knowledge (Miller, 1997). Environmental uncertainty generates uneasiness because of the difficulty to predict what may happen owing to the lack of sufficient information, which can also lead to perplexity due to doubts and unknown consequences (Kwok et al., 2019).

There is a proof that the current environment is highly uncertain and has changed as a result of the COVID-19 epidemic. Have these changes occurred as a result of the increased situational opportunities and restrictions brought about by the pandemic-related measures. Have these developments escalated the problems as a result of how the environment affects businesses (Geng et al., 2022). In order to survive in such uncertain environment, an organization should first predict and interpret the potential for uncertainty to harm the business environment (Eker and Eker, 2019). Being aware to environmental uncertainty is important to help organizations compete and enhance their business performance through considering the changes brought on by economic, social and political advancements (Abu Afifa and Saleh, 2022). Awareness to environmental uncertainty assists managers to be aware of their surroundings, which can help them predict the optimum decision (Kwok et al., 2019).

2.1.5 Organizational Information Processing Theory

The Organizational Information Processing Theory (OIPT) considers the organization as an open information-processing system that should cope with a variety of uncertainties (Gu et al., 2021). To mitigate the negative impacts of such uncertainties, organizations should improve their information-processing capabilities (Galbraith, 1974). In order to generate more timed decision-making and unified actions in a changing environment, today's organizations must collect streamlined information (Gu et al., 2021).

The OIPT argues that, organizations should increase their information-processing capacities as uncertainty increases to meet information needs (Daft and Lengel, 1986). Organizations will misread environmental cues and conflicts in risk management practices if their information processing

capacities are inadequate (Daft and Lengel, 1986). OIPT explains organizational behavior through the examination of the information flows that occur within and beyond organizational boundaries (Daft and Weick, 1984). The key job of organizational design, according to OIPT, is to manage uncertainty by acquiring, processing, and disseminating information from the business environment (Daft and Weick, 1984).

OIPT provides us with a theoretical lens to understand how organizations implement environmental scanning along with process innovation to build organizational resilience. Our current study considers that process innovation acts as an information-processing capability. In other words, based on the OIPT, we consider environmental scanning as an information gathering technique through which the organization acquires knowledge about the external environment. Further, such information is interpreted and converted into new processes and new ways of doing business through process innovation. Therefore, this will facilitate an organization's resilience in the face of disruptions through the ability to make immediate reactions and changes in the current processes to match the requirements of the environment.

2.2 Conceptual framework and hypotheses development

To cope with potential challenges, the literature has asserted on the significance of continually monitoring the internal as well as the external environment (Burnard et al., 2018). Environmental scanning and other foresight methods are supposed to improve the businesses' flexibility and adaptation by allowing for the early detection of significant events and trends. Other departments receive up-to-date information on relevant trends and changes from foresight units, allowing them to adjust their strategies quickly (Haarhaus and Liening, 2020).

Moreover, organizational resilience is known as an organization's ability to detect and modify dysfunctional tendencies and cope positively with unpredicted events (Ortiz-de-Mandojana and Bansal, 2016). This means that organizational resilience starts with sensing maladaptive tendencies occurring externally. This sensing function is the main function of environmental scanning. Organizations need to gain information on relevant trends and developments. In this regard, environmental scanning is frequently employed to detect and understand discontinuities in an organization's environment; hence enabling it to quickly commit resources to new courses of action in response to change. Therefore, a quick adaptation of the respective strategies can be achieved (Haarhaus and Liening, 2020).

The awareness of crisis and a sense of adverse environmental shifts are critical for proactive, continual modification, and adaptation that strengthens organizations' resilience. Managers, therefore, should regularly convene forward-looking discussions among the internal and external stakeholders of the organization to facilitate the anticipation of what is going to come and energize their organizations to respond to the change (Lv et al., 2018). Through environmental scanning, an organization can understand potential future challenges (Paraskevas and Quek, 2019). Knowing these warning signs in advance allows an organization to develop shock absorption techniques beforehand, thereby averting or alleviating future issues (Carmeli and Markman, 2011).

Similarly, Hillmann and Guenther (2021) emphasized that awareness, sense-making, and anticipation of risks and possible future developments can reduce organizations' vulnerability and raise awareness, thus, increasing their resilience (Hillmann and Guenther, 2021). Organizations can respond quickly to environmental changes via improving their employees' skills to sense, monitor, and respond to environmental changes. Similarly, managers should strategically place their organizations to be amongst the first to find and obtain external knowledge regarding their market trends, technologies, and industry in order to adjust speedily to environmental disruptions and enhance their resilience (Akpan et al., 2021).

Environmental scanning aids organizations in recognizing external trends and developments and determining the necessary capabilities needed to effectively adapt and to be more resilient (Beal, 2000; Castanias and Helfat, 2001). Therefore, we argue that resilience depends on organizations' capacity to anticipate change and its preparedness to respond. In this vein, environmental scanning is a technique for identifying prospective challenges and opportunities that might arise in the external environment. Therefore, we suggest the following hypothesis:

Hypothesis 1Environmental scanning significantly and positively affects organizational resilience.

Environmental scanning enables organizations to be alert and sensitive to environmental volatiles, making it simpler to spot and capitalize on innovation opportunities (Grimpe and Sofka, 2009). Organizations that are able to recognize external trends trough environmental scanning can adjust their internal processes and resource allocation to develop new goods and services and improve existing ones (Tang, 2014).

Environmental scanning can support an organization's process innovation through strengthening its capability to process and integrate new information (Koberg et al., 1996), assisting it in locating and gaining access to the resources needed to generate and disseminate innovations (Tang et al., 2014), and aiding it in understanding customers' needs and adjusting internal processes accordingly in order to be able to differentiate its products from competitors' offerings (Beal, 2000).

Through aptly utilizing environmental scanning, organizations can use external information to appropriately

formulate new processes, strategies and decisions. More importantly, environmental scanning allows organizations to adapt to changes and modify their internal processes and strategies quickly and on time (Tang, 2016).

Strategic foresight methods, including environmental scanning, lead to earlier identification of threats, opportunities and the assessment of innovative ideas (Ruff, 2006). The ability of an organization to anticipate new trends and determine latent market demands is determined by how well knowledge-processing routines and procedures are managed inside it. Moreover, organizations' environmental scanning delivers information to managers, enabling them to better comprehend their environments, make improved and quicker decisions, execute suitable strategies, avert becoming surprised by unexpected events, and guide their organizations to seize new opportunities by transforming current processes into new ones and implementing new or improved production or delivery method (Ireland et al., 2009). Accordingly, we suggest the following hypothesis:

Hypothesis 2. Environmental scanning significantly and positively affect process innovation.

The change domain was identified by Hillmann and Guenther (2021) as one of the primary domains in conceptualizing organizational resilience. Although building organizational resilience entails maintaining stability, a resilient organization can also manage internal change that results from external environmental pressures simultaneously. One of the attributes within the change domain is the ability to renew (or reinvent or reconfigure), which is about an organization's proactive change before the change is desperately necessary and constant renewal of internal processes through process innovation (Hillmann and Guenther, 2021).

In general, innovation is necessary for survival in dynamic and complex environments and is a requirement for building organizational capacity to cope with environmental variations (Mafabi et al., 2015). Innovative organizations possess are better at adopting, adapting, implementing, and leveraging novel ideas effectively for modifying and improving their internal processes (Schot and Geels, 2008). In this regard, organizational resilience is built based on an organization's ability to transform its current way of doing business into a new way that meets the needs of its environment (Chaharbaghi et al., 2005). The change, transformation and improvement of internal processes achieved through PI is important for an organization's survival (O'Regan and Ghobadian, 2011). Innovation does not only concentrate on gradual or dramatic changes to preserve marketing or financial performance, but also on organization's internal structures that maintains the stable circumstances that promote organizational resilience (Nunez-Rıos et al., 2022). For example, some organisations better adapted to the demands of customers through redesigning the work processes to meet the requirement for improved service delivery (Ongaro, 2004). This change necessitates innovation, in which new processes are developed and executed (Mafabi et al., 2012).

Caiden (2003) recommended that organizations should change their working styles, procedures and processes, structures, rules and regulations to add value. Castillejo et al. (2009) found that there was a nexus between process innovation and business growth. Resilient organisations should develop new business processes that are considered suitable for efficiency as well as effectiveness (Li-Hua, 2007). The renewal of business processes necessitates a specific level of innovation, i.e., introducing new production methods and techniques, testing them out, and learning from them until the ideal system is established (Bawden and Ortun, 2002). Process improvement can therefore be viewed as a social learning concept in which various employees combine their intellectual capital to enhance innovation in structures and processes to build organizational resilience (Mafabi et al., 2015). Creating new organizational routines and processes is a trait of adaptive resilience (Aulia and Soetjipto, 2021).

Based on the previous discussion, we argue that changing, transforming and improving internal processes through process innovation can help organizations to be ready to face disruptive and adverse events that occur within their environments making them more resilient via rebuilding the system that constitutes their product offerings. Therefore, we suggest the following hypothesis:

Hypothesis 3. Process innovation significantly and positively affects organizational resilience.

Combining the debates of H1, H2 and H3, we propose that process innovation mediates the relationship between environmental scanning and organizational resilience. This hypothesis relies on the idea that environmental scanning promotes process innovation, and that process innovation is positively linked with organizational resilience. It is important to understand organizational resilience as an ongoing process that encompasses external factors as well as organizational design and cohesively links operating units to their regulatory, coordination, communication, and accountability mechanisms at all levels to deal with dynamic circumstances (Nunez-Rıos et al., 2022). In this vein, we view environmental scanning as a method for dealing with the external factors through collecting information, while process innovation is responsible for changing or renewing the internal organizational design based on the information gathered through environmental scanning to ultimately enhance organizational resilience. Resilient organizations acquire knowledge about their environments to implement changes in their internal processes and ways of doing things to ultimately build resilience (Garcia-Morales et al., 2006). An organization's ability to process knowledge and incorporate it into its dynamics with the aim of adjusting its behavior and improving its performance is a way for building resilience (Valaei et al., 2017).

Besides, early research recommends that the quicker response to environmental information ahead of rivals and not signs from environmental scanning is what contributes to survival (Hambrick, 1982). Similarly, Barasa et al. (2018) emphasized that organizational resilience is based on the management and usage of information.

Moreover, from the perspective of OIPT, dealing with uncertainty via acquiring, processing, and disseminating information about the organization's environment is the major task of an organization's design (Daft and Weick, 1984). The OIPT contends that, an organization's information-processing capacity should increase according to uncertainty increases to meet information needs (Daft and Lengel, 1986). Here, we consider environmental scanning as a capability for gathering information, which can help organizations to face uncertainty with more resiliency. However, in order to use the information gathered through environmental scanning in building resilience, and according to the OIPT, it is important then to translate such information into improved internal processes, production methods and management approaches that help in building a more resilient organization. There should be a mediator, which is process innovation, to translate the signals obtained through environmental scanning in order for organizations to be able to respond to the environmental changes. We, therefore, believe that building organizational resilience is a three-step process that starts with scanning, then analyzing and restructuring inner organizational connections/processes through PI, in order to finally build differentiators and survive through being more resilient. Accordingly, we suggest the following hypothesis:

Hypothesis 4. Process innovation mediates the relationship between environmental scanning and organizational resilience.

We believe that the degree to which higher levels of environmental scanning contribute to higher levels of organizational resilience depends on the level of environmental uncertainty. This is because environmental scanning is especially useful in situations when there are high uncertainty levels, because ES fosters an organization's ability to detect new opportunities and threats and enable it to flexibly adapt to its changing environment. This idea agrees with existing literature, which suggests that businesses need the capacity to quickly adapt in order to survive in unpredictable and unstable environments (Cornelius et al., 2005; Vecchiato, 2015).

Moreover, dynamic capabilities are much more useful in unpredictable environments since they allow an organization to consciously adjust its underlying capabilities in order to trigger strategic modifications in response to environmental changes (Schilke et al., 2018). However, strategic foresight methods in stable, foreseeable environments are not as valuable as they are in unpredictable environments, because the dynamic capabilities offered by strategic foresight methods are not as important in stable environmental circumstances. In stable and foreseeable environments, the traditional linear approaches of management are more suitable for producing reasonable future projections (Levy, 2000).

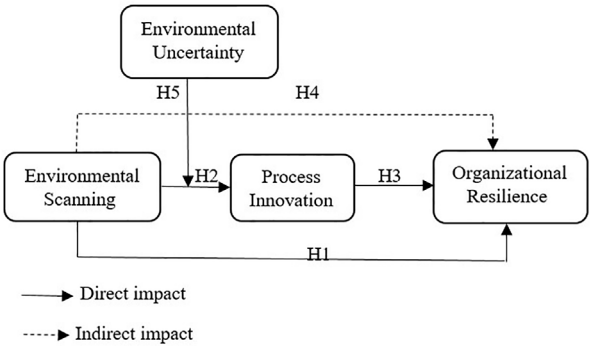

FIGURE 1
Conceptual framework.

The logic behind this moderation is that in an uncertain environment, organizations must make reliable projections about future changes, and that is why environmental scanning is necessary. Similarly, in uncertain business circumstances, organizations nees dynamic capabilities, such as organizational resilience, to respond to and shape unknown futures (Hambrick, 1982). The greater uncertainty an organization faces, the extra information it must collect and analyze to survive (Bode et al., 2011). Therefore, we expect that in high uncertain environments, environmental scanning will be more strongly related to organizational resilience through process innovation. Accordingly, we suggest the following hypothesis:

Hypothesis 5. Environmental uncertainty moderates the indirect relationship between environmental scanning and organizational resilience, such that the greater the environmental uncertainty, the greater the positive effect of environmental scanning on organizational resilience through process innovation.

The conceptual model (Figure 1) illustrates the relationships between research variables

3 Materials and methods

3.1 Sample and data collection

This study focuses on SMEs in the industrial zones of New Damietta City in Egypt. Egypt is well-suited to the subject as it is a developing country with an economy that largely depends on SMEs (SEAM Programme, 2021). Egypt has 2.5 million SMEs, which account for more than 90% of the country's enterprises and 75% of the country's workforce, and many of which are in

manufacturing. The Egyptian informal economy is a sizeable one, estimates of its contribution to GDP range from 40% to 70% (UNIDO, 2020, p.7). Researchers have recently become interested in entrepreneurship and SMEs because of their unique strategies for addressing economic and social issues and their positive effect on communities, particularly in developing countries (Li Z. et al., 2022). The New Damietta industrial zone's industrial activities contribute significantly to Egypt's national output. Damietta's industrial sectors are more diverse, with the furniture and wood manufacturing sectors accounting for 64.7 percent and 23.3 percent of total industrial output, respectively, of Damietta's establishments, amounting to 26.1 percent and 26.3 percent of the Egyptian national output (SEAM Programme, 2021).

We focused on data collected from top and middle-level managers at various manufacturing SMEs. We chose this sample since those managers are the most involved in scanning activities and innovation practices. We randomly reached 384 SMEs that were located in the two industrial zones of new Damietta city in Egypt. Random sampling presuppose that each case in the population has the same probability of being selected. The term "random sampling" refers to the process of randomly selecting members from a population. Therefore, a sample properly represents the whole population (Mackey and Gass, 2012). Random samples are preferred by most researchers because they enhance external validity and eliminate researcher bias in sample selection and enhances generalization from the sample to the entire population (Begum et al., 2021). We personally visited the SMEs, met the managers and clarified the research objectives to increase their desire to cooperate with this survey. At the same time, we explained the survey purpose in the questionnaire cover letter and assured about the anonymity of the respondents by promising not to divulge their information.

The study population consisted of Egyptian manufacturing SMEs working in two industrial zones in New Damietta City, totaling (512) SMEs. Data were collected via a self-administered questionnaire. The questionnaire was first prepared in English, then translated into Arabic and afterwards returned into English to ensure that the scale items were accurately translated. This procedure verified that the true meaning of each item in the original questionnaires was consistent (Saunders et al., 2009). We were able to reach 384 random enterprises (with a reach rate of 75%). We finally obtained 249 valid surveys with no missing data (with an effective response rate of approximately 65%). We gathered one response (i.e. one questionnaire) per enterprise. This means that we had only one answer from each enterprise, as our unit of analysis was the enterprise itself. The empirical context for our study sets a population parameter of Egyptian SMEs manufacturing firms that are still able to continue operations amidst the COVID-19 pandemic with data collected using a simple random sampling method. Table 1 shows the demographic characteristics of the study sample.

3.2 Non-response bias, multicollinearity, and common method Bias remedies

We followed Armstrong and Overton (1977) to assess the non-response bias through comparing early respondents to late ones. The results of the *t*-test indicated that there were no significant statistical differences ($\rho < 0.05$) among the early and late respondents, implying that non-response bias is not a problem in this study.

Moreover, we checked the structural model for multicollinearity using variance inflation factors (VIF) for each of the items. To avoid multi-collinearity, Hair et al. (2018) suggested that the VIF cut-off value must be less than 5.0. All VIF values in this study ranged from 1.320 to 4.610, indicating that there is no issue of collinearity.

Besides, CMB could be a potential problem because we used self-reported questionnaires. Accordingly, we used Podsakoff et al.'s (2003) procedural remedies to minimize CMB. First, to mitigate social desirability bias, we followed the procedures of previous literature (e.g., Fernandes and Randall, 1992; Begum et al., 2021) and separated the predictors and criterion variables to make them appear independent, guaranteed respondents' anonymity, and adopted well-developed instruments with proven psychometric properties. Second, we followed the method of previous literature to analyze CMB (Podsakoff et al., 2003; Ashfaq et al., 2020; Awan and Sroufe, 2020; Ashfaq et al., 2021; Begum et al., 2021) and used SPSS to run the test of Harman's single-factor (Harman, 1976), which is employed when a single variable can explain most of the deviation. The total variance for a single factor was fond to be 33.219%, which is less than 50%, indicating that CMB did not affect our data.

3.3 Questionnaire design and measures

In order to test the hypotheses using the empirical data, the study employed a mixed-methodology approach in which information was acquired through a standardized questionnaire and interviews with Egyptian SMEs' mangers (Local Burden of Disease, 2021; Paulson et al., 2021; Al Halbusi et al., 2022; Farzadfar et al., 2022).

We gathered data using a questionnaire, with responses measured using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Environmental scanning was assessed through a 4-item scale adopted from Haarhaus and Liening (2020). A sample item is "our company analyzes the environment with a very long-term perspective (min.

TABLE 1 The demographic characteristics of managers and SMEs (n = 249).

Characteristic	Frequency	%	Characteristic	Frequency	%
Manager's Gender			**SME's age**		
Male	192	77.1	Less than 5 years	47	18.9
Female	57	22.9	5–10	86	34.5
Manager's Age			11–15	40	16.1
21–30	54	21.7	More than 15	76	30.5
31–40	109	43.8	SME's size (Employees' number)		
41–50	43	17.3	Less than 10 employees	39	15.7
Older than 50	43	17.3	10–50	138	55.4
Managers' Educational Level			More than 50	72	28.9
Bachelor's degree	200	80.3	SME's ownership		
Post-graduate	49	19.7	Sole proprietorship	172	69.1
Manager's Position			Partnership	59	23.7
Production manager	51	20.5	Others	18	7.2
Owner manager	50	20.1	Industry type		
General manager	44	17.7	Furniture	90	36.1
Operations manager	39	15.7	Food and beverage	24	9.6
R & D manager	37	14.9	Chemicals	23	9.2
Financial manager	28	11.2	Electronics and electrical	21	8.4
Manager's Job experience			Plastics and rubber	16	6.4
Less than 5 years	91	36.5	Fabricated metal product	15	6
5–10	90	36.1	Building materials	11	4.4
More than 10	68	27.3	Paper	11	4.4
			Textiles and apparel	10	4
			Others	28	11.2

10 years)." Process innovation was measured through a (4) item scale derived from Wang and Ahmed's (2004) organizational innovation scale. A sample item is "we are constantly improving our business processes." Organizational resilience was assessed through a (9) item scale adopted from Kantur and Iseri-Say, (2015). This scale is further divided into 3 dimensions of robustness (4 items), agility (3 items), and integrity (2 items). A sample item is "our company stands straight and preserves its position." Environmental uncertainty was measured by a 4-item scale adopted from Milliken (1987). A sample item is "how our market is going to change over the next 10 years is unpredictable" (See Supplementary Appendix Table S1).

TABLE 2 α, CR, and AVE.

Measurement items	α	CR	AVE
Environmental Scanning	0.865	0.908	0.712
Process Innovation	0.770	0.847	0.583
Organizational Resilience	0.881	0.905	0.516
Robustness	0.845	0.896	0.683
Agility	0.831	0.899	0.747
Integrity	0.814	0.915	0.843
Environmental Uncertainty	0.925	0.946	0.816

4 Data analysis and results

We employed Smart PLS software, version 3.0 to analyse the data using partial least squares (PLS) analysis. We adopted the structural equation modeling (SEM) approach along with partial least square (PLS) because PLS-SEM has been widely used in testing and validating theory. PLS-SEM is widely used in several business disciplines because it gives robust structural model estimations, especially in case of a complex structural model (Afthanorhan, 2013). Besides, using the PLS approach is suitable for the relatively small sample size and especially appropriate for estimating inner and outer model parameters and non-parameter bootstrapping with 5,000 replications (Hair et al., 2012). We followed a two-step approach as suggested by Henseler et al. (2014) including: 1) assessment of measurement model and 2) assessment of structural model.

TABLE 3 Cross loadings of individual items.

	Environmental Scanning	Process innovation	Robustness	Agility	Integrity	Environmental uncertainty
ES1	**0.864**	0.539	0.281	0.237	0.137	−0.106
ES2	**0.850**	0.450	0.248	0.286	0.128	−0.112
ES3	**0.801**	0.407	0.253	0.356	0.096	−0.083
ES4	**0.858**	0.526	0.318	0.328	0.114	−0.076
PI1	0.312	**0.673**	0.334	0.325	0.347	−0.167
PI2	0.517	**0.768**	0.457	0.428	0.321	−0.099
PI3	0.478	**0.822**	0.456	0.371	0.259	−0.167
PI4	0.418	**0.781**	0.484	0.405	0.236	−0.143
OR1	0.230	0.445	**0.781**	0.466	0.424	−0.181
OR2	0.312	0.460	**0.811**	0.642	0.337	−0.142
OR3	0.262	0.527	**0.876**	0.503	0.413	−0.155
OR4	0.278	0.459	**0.835**	0.531	0.344	−0.125
OR5	0.258	0.459	0.594	**0.869**	0.339	−0.134
OR6	0.337	0.454	0.536	**0.873**	0.316	−0.163
OR7	0.328	0.394	0.553	**0.850**	0.401	−0.166
OR8	0.180	0.379	0.450	0.398	**0.926**	−0.144
OR9	0.075	0.309	0.389	0.349	**0.910**	−0.157
EU1	−0.106	−0.194	−0.189	−0.156	−0.129	**0.942**
EU2	−0.069	−0.132	−0.130	−0.167	−0.144	**0.910**
EU3	−0.125	−0.197	−0.162	−0.166	−0.158	**0.943**
EU4	−0.093	−0.121	−0.174	−0.164	−0.170	**0.812**

The values in boldface represent score of each item on its own construct.

4.1 Assessment of measurement model

4.1.1 Assessing convergent validity

We used item factor loadings, cronbach's alpha, and average variance extracted (AVE) to evaluate reliability and convergent validity (See Table 2). All of the factor loadings were ranging from 0.673 to 0.943 meaning that they all are greater than the suggested threshold of 0.5 (Hair et al., 2014). Furthermore, as shown in table (2), Cronbach's alpha (α) and the composite reliability (CR) for all constructs were higher than the suggested threshold of 0.7, indicating that the measures were reliable (Hair et al., 2010). Besides, to assess convergent validity, Fornell and Larcker (1981) suggested that average variance extracted (AVE) should be equal to or more than 0.5. Table 2 illustrates that AVE is more than 0.5 for all variables, demonstrating acceptable convergent validity for all variables.

4.1.2 Discriminant validity

Following the establishment of reliability and convergent validity, discriminant validity of the measurement model is assessed using cross loadings of individual items as well as by using Fornell-Larcker criterion and Heterotrait-Monotrait Ratio (HTMT).

4.1.2.1 Cross loadings of individual items

Discriminant validity refers to the degree to which a construct is truly distinctive from the other constructs by empirical criteria. Accordingly, the establishment of discriminant validity entails that a construct is distinct and reflects phenomena not captured by the other constructs in the same model (Hair et al., 2014). To measure discriminant validity, we calculated cross loadings of individual items. Items must score more on their own constructs in the model for discriminant validity to be achieved (Fornell and Larcker, 1981; Chin, 1998) as indicated by bold numbers in Table 3 for all items.

4.1.2.2 Fornell-Larcker Criterion

Table 4 shows that the square root of the average variance extracted for each focal construct is higher than the variance shared with the other constructs (Henseler et al., 2009). This shows that the measures used in the current study are valid and internally consistent.

4.1.2.3 Heterotrait-Monotrait Ratio (HTMT)

According to the most conservative criterion, if HTMT is below 0.85, we indicate discriminant validity (Kline, 2011). We find that the maximum HTMT value is 0.773, which is less

TABLE 4 Fornell-Larcker Criterion (Correlation between constructs and the square root of AVE).

	Environmental Scanning	Process innovation	Robustness	Agility	Integrity	Environmental uncertainty
Environmental Scanning	**0.844**					
Process Innovation	0.574	**0.763**				
Robustness	0.328	0.573	**0.827**			
Agility	0.355	0.504	0.650	**0.864**		
Integrity	0.141	0.376	0.458	0.408	**0.918**	
Environmental Uncertainty	−0.112	−0.185	−0.182	−0.179	−0.163	**0.903**

The values in boldface represent square roots of AVE.

TABLE 5 Heterotrait-Monotrait Ratio (HTMT).

	Agility	Environmental Scanning	Environmental uncertainty	Integrity	Process innovation
Environmental Scanning	0.423				
Environmental Uncertainty	0.206	0.123			
Integrity	0.494	0.165	0.192		
Process Innovation	0.631	0.692	0.218	0.483	
Robustness	**0.773**	0.381	0.206	0.552	0.708

The value in boldface represents the maximum HTMT value.

than 0.85 (see Table 5). Therefore, discriminant validity is established.

4.2 Assessment of structural model

4.2.1 Assessing R square (R^2)

The R^2 value is the amount of variance in the dependent variable(s) that can be attributed to one or more predictor variables (Hair et al., 2010). R^2 threshold values of 0.19, 0.33, and 0.67, respectively, represent weak, moderately strong, and substantially strong values (Chin, 1998). R^2 calculation revealed that environmental scanning and process innovation collectively explained 41.2% of the variance in organizational resilience.

4.2.2 Assessing F square (f^2)

Chin (1998) suggested evaluating the change in R^2 when a specific predictor latent variable is excluded from the structural model, and determining whether the excluded variable has a significant effect on the dependent variable. The F square, or effect size, is the change in R^2 caused by omitting a single predictor latent variable.

Small effect size is represented by values ranging from 0.02 to 0.15, medium effect size is represented by values between 0.15 and 0.35, and large effect size is represented by values above 0.35. (Cohen, 1988). ^{f2}values indicated that environmental scanning had a large effect on process innovation (0.416), but had no effect on organizational resilience (0.003). Furthermore, process innovation had a large effect on organizational resilience (0.426).

4.2.3 Assessing Q square (^{Q2})

Furthermore, for assessing the structural model, $^{\text{we calculated Q2}}$ via blindfolding. In PLS-SEM, a ^{Q2}value that is higher than zero for a particular endogenous construct illustrates path model's predictive relevance for a specific dependent construct, and once the structural model displays predictive relevance, it adequately predicts the data that are not included in estimating the model (Hair et al., 2016). In this study, the ^{Q2}values of both process innovation (0.185) and organizational resilience (0.203) are acceptable, implying that the minimum requirements then are met.

4.2.4 Goodness of Fit

Tenenhaus et al. (2005) defined global fit measure (GOF) as the arithmetic mean of both the average variance extracted and the average of the R squares of all endogenous variables. The goal of GOF is to account on the study model at both the measurement and structural levels of the model, with an emphasis on the model's overall performance (Chin, 2010; Henseler and Sarstedt, 2013).

We calculated GOF manually by applying Eq. 1 (adopted from Wetzels et al., 2009, p. 187):

TABLE 6 Path coefficients for the different models.

	Model 1 (without mediator)							
Effects	Coefficient	SE	T -values	*p*-values	2.5%	97.5%	Hypothesis	Result
Control Variables								
Firm size->OR	0.005	0.061	0.087	0.931	−0.118	0.122		
Industry type->OR	−0.005	0.047	0.100	0.920	−0.091	0.086		
ES->OR	−0.052	0.057	0.691	0.490	−0.201	0.083	H1	Rejected
ES->PI	0.575	0.051	11.304	#385623; 0.000	0.472	0.669	H2	Accepted
PI ->OR	0.621	0.057	10.867	#385623; 0.000	0.508	0.724	H3	Accepted
	Model 2 (With Mediator)							
Indirect ES->PI->OR	0.357	0.047	7.654	#385623; 0.000	0.268	0.459	H4	Accepted
Model 3 (With Moderator)								
Moderating effect 1 ->PI->OR	0.054	0.071	0.765	0.445	−0.137	0.108	H5	Rejected

$$\text{GoF} = \sqrt{\left(\overline{R^2} \times \overline{AVE}\right)} \quad (1)$$

More specifically, it is the square root of the average of all R square of the study multiplied by the average of all AVE of the study.

Accordingly,

$$GoF = \sqrt{\frac{0.412 + 0.354}{2} \times \frac{0.712 + 0.583 + 0.516 + 0.683 + 0.747 + 0.843 + 0.816}{7}} = 0.518$$

As per Wetzels et al. (2009), GoF below 0.1 means that the model has no fit, GoF ranging from 0.1 to 0.25 implies small fit, GoF ranging from 0.25 to 0.36 implies medium fit, and GoF more than 0.36 indicates large fit. Therefore, according to the criteria of Wetzels et al. (2009), and the GoF value of (0.518) it can be inferred that the GoF model of the current study is large enough to consider adequate global PLS model validity.

4.2.5 Hypotheses testing

4.2.5.1 Mediation analysis

As shown in Table 6, control variables (firm size and industry type) are insignificant and have no impact on organizational resilience based on T statistics> 1,96, *p*-value<0.05 (β = 0.005, p = 0.931 and β = −0.005, p = 0.920 respectively). Besides, the confidence intervals of −0.118 to0.122 and −0.091 to 0.086 respectively contain zero, indicating that it is not statistically different from zero.

To test the hypotheses, we used the bootstrap procedure developed by Preacher and Hayes (2004, 2008). Environmental scanning' direct effect on organizational resilience is −0.052, which is not statistically significant (p- value = 0.490) based on T statistics> 1.96, *p*-value<0.05 and the confidence interval of −0.201 to 0.083 contains zero, implying that it is not statistically different from zero. This indicates that H1 is not accepted. The examination of the mediating role of process innovation in the environmental scanning –organizational resilience relationship indicates that environmental scanning significantly influences process innovation (a = 0.575, p value = 0.000), while process innovation in turn significantly influences organizational resilience (b = 0.621, p-value = 0.000) (see Table 5). The results further show that the indirect effect of environmental scanning on organizational resilience through process innovation (ab = 0.357, p-value = 0.000) is statistically different from zero, as indicated by a 95% bootstrap confidence interval of 0.268–0.459 (see Table 6). Therefore, we reach support for H4 that process innovation fully mediates the relationship between environmental scanning and organizational resilience relationship.

4.2.5.2 Conditional Indirect (Moderated Mediation) analysis

Table 6 shows that the indirect effect of environmental scanning on organizational resilience via process innovation is not significant at different levels of environmental uncertainty (β = 0.054, p = 0.445), such that environmental uncertainty can not moderate the indirect relation between environmental scanning and organizational resilience. Thus, we do not find evidence to support H5 that at increasing degrees of environmental uncertainty, the conditional indirect effect of environmental scanning on organizational resilience through process innovation is not reinforced.

5 Discussion and conclusion

The COVID-19 epidemic has had a significant negative impact on businesses and has grown to be the major challenge and has affected every community (Yu et al., 2022). Various firms have experienced numerous health and operational issues as a result of

COVID-19 (Aman et al., 2022; Ge et al., 2022; Rahmat et al., 2022; Yu et al., 2022). Businesses have experienced issues like health issues, changes in international and export orders, and a shortage of raw materials (Aqeel et al., 2021; Paulson et al., 2021; Li et al., 2022a). As a result, scholars started to concentrate on investigating how businesses can survive amidst the pandemic. Accordingly, this study tried to investigate how Egyptian SMEs remained resilience in the face of COVID-19 pandemic through examining the impact of environmental scanning on organizational resilience both directly and indirectly through the mediation of process innovation of Egyptian SMEs. Therefore, this study is amongst the first studies to investigate the factors contributed to Egyptian SMEs' fight against COVID-19 pandemic, since studies in this regard are still largely lacking. Insights from this study will, therefore, contribute to understanding how SMEs were able to respond to the epidemic across Africa. The results of this study will contribute to enabling Egyptian managers in developing measures of policy and crisis response to reduce the adverse effects of the COVID-19 pandemic on their businesses.

The results revealed that PI had a positive effect on OR (H3 was accepted). This result demonstrates that Egyptian SMEs adopted PI to remain resilient in the face of the COVID-19 pandemic. Furthermore, PI can assist organizations in building OR based on their ability to transform their way of doing business in a new way that matches the needs of their environments (Mafabi et al., 2012). In agreement with our result, O'Regan and Ghobadian (2011) emphasized the importance of the transformation conducted through innovation for survival. This result is consistent with the those of Cho et al. (2007); Stewart and O'Donnell (2007); Tan (2004); Mafabi et al. (2012); Mafabi, et al. (2015); Williams et al. (2017); Filimonau and De Coteau (2020) and Nunez-Rıos et al. (2021) who agreed that innovation contributes to building resilience.

Moreover, regarding the role of PI in building OR during the disruptive event of COVID-19, we conducted our current study during the COVID-19 pandemic to explore how Egyptian SMEs struggled to remain resilient during the pandemic. In consistence with our results during the pandemic, Ahn et al. (2018) observed that pursuing open and closed innovation during crises permits organizations to achieve resilience. Similarly, Senbeto and Hon (2020) confirmed the relevance of innovation during a crisis by demonstrating that employees' innovative capabilities can be a suitable strategy to overcome adversity. Additionally, Vakilzadeh and Haase (2021) claimed that an organization's ability to innovate during adversity is critical for resilience. In the study of Giousmpasoglou and Marinakou (2021), one of the main qualities of general managers that emerged as crucial during the COVID-19 pandemic was innovation and resilience building. Besides, Rao (2022) asserted that the turbulent times necessitate innovation and that innovation is the key to survival and success.

Our results are also consistent with Bhattacharyya and Thakre's (2021) investigation of Indian SMEs' tactical short and long-term strategic responses to face the COVID 19 pandemic. In accordance with our study, they found that companies focused on surviving the crisis in the short-term by reconfiguring existing resources while also initiating long-term recovery by mobilizing efforts for a redesigned business model. Their study also suggested that companies encouraged innovative solutions in order to survive the crisis. Similarly, and according to Joly (2020), business models could be revamped by mobilizing the employees to innovate and find new ways to achieve the companies' purpose during times of crisis such as COVID 19.

Our results also revealed that ES positively affected PI (H2 was accepted). This result indicates that the early detection of external events, risks and/or opportunities facilitates the rapid development of existing processes. The regular scanning of the external environment enables SMEs to be aware and sensitive to environmental changes, thereby enabling them to easily identify and seize opportunities for innovation. This result agrees with those of Koberg, et al. (1996); Beal, (2000); Andriopoulos and Gotsi (2006); Ruff (2006); Grimpe and Sofka, (2009); Von der Gracht et al. (2010); Tang (2014) and Tang, et al. (2014). Furthermore, in light of our results during the COVID-19 pandemic, Bhattacharyya and Thakre (2021) asserted that in order to confront a crisis such as COVID- 19, managers need to apply dynamic capabilities-based thinking, namely, sensing, seizing and reconfiguring. Managers then must determine the resources and capabilities required by their firms, which needs to be sensed by the ES. Once the exact points of external stimuli are identified, then organizational processes should be prepared to seize the requirements of the environmental stimuli. Finally, organizational processes and systems have to be reconfigured and/or transformed through PI to create and enhance the required resources and capabilities to respond to the crisis.

Furthermore, we found no direct effect of ES on OR (H1 was rejected). However, we also found that PI fully mediated the relationship between ES and OR (H4 was accepted). This means that without PI, Egyptian SMEs may not become resilient enough to withstand shocks and provide improved products. The study has proved that ES per se cannot improve OR in Egyptian SMEs, meaning that environmental information must be used to improve organizational structures, processes, and competences, in order to make Egyptian SMEs more resilient.

Research has emphasized the importance of regularly monitoring the internal and external environments to deal with future difficulties (Burnard et al., 2018). Additionally, Akgün and Keskin, (2014); McManus, (2008); Hamel and Valikangas, (2003); Weick et al. (1999) and Reeves et al. (2016) asserted that perceiving weak signals of environmental changes is important for effective response and progress. Furthermore, Stephenson et al. (2010) indicated that organizations should proactively monitor what is happening in their environments. This could be achieved by activities such as ES. Further, Vakilzadeh and Haase (2021) confirmed

that ES, as an anticipation mechanism, is regarded as a building block of OR.

Although numerous researchers asserted the importance of ES to build OR as explained in the previous paragraph, none of those studies mentioned how firms may use information gathered through ES. This point is what makes our results different from those studies. In light of our results, merely acquiring information about the external environment without seizing it or translating it into new processes that match the new environmental circumstances is not enough for survival. There should be a powerful mediator in the relationship between ES and OR that can translate the information acquired into new and improved processes to help organizations become more resilient in the face of environmental disruptions. This result of our current study agrees with Barasa et al. (2018, p.497) who noted that organizational resilience widely depends on how information is managed and used.

The result of H4 implies that information about business environment must be used to improve and/or redesign organizational structures, processes, and competences in order to make SMEs resilient. This result supports our expectation regarding the role of OIPT in explaining the link between ES, PI, and OR. This is the main contribution of our study, which proves that PI is a strong mediator in the relationship between ES and OR by employing the OIPT theory for the first time to investigate such a relationship. Our result confirms the notion of Hambrick (1982) that a faster response to environmental information than competitors, and not signals from environmental scanning is the most important for survival (Hambrick, 1982). Besides, Amidst Covid-19 pandemic, organizations should seek more related information via several sources (e.g., social media platforms) to detect the perceived risks that businesses are going to confront in order to minimize the negative effects on their operations and improve their survival (NeJhaddadgar et al., 2020).

Our study also shows that an increased level of environmental uncertainty does not increase the positive impact of environmental scanning on organizational resilience through process innovation (H5 was rejected). Our point of view regarding what may affect the moderating role of environmental uncertainty in the relationship between environmental scanning, process innovation and organizational resilience is that environmental uncertainty is not always easily recognizable; therefore, the manager becomes uncertain regarding the external environment. In other words, there is a difficulty in predicting the events that may occur in the environment. Hence, the information provided by the systems responsible for conducting the environmental research is of little utility at the low degree of environmental uncertainty. Moreover, Zahra et al. (2006) claimed that a dynamic environment is not a necessity for building dynamic capabilities. Similarly, Zollo and Winter (2002) supported this claim by supposing that dynamic capabilities are found and exploited even in environments with slower change rates. Furthermore, we believe that the information gained through environmental scanning can reduce environmental uncertainty.

Additionally, environmental uncertainty causes uneasiness because of the inability to predict what may happen owing to a lack of sufficient knowledge (Kwok et al., 2019). Therefore, performing environmental scanning implies that information is not missing. Instead, environmental scanning ensures that up-to-date information is constantly available. This means that with a regular environmental scanning, environmental uncertainty may not exist or may be at its lowest level.

Our result on the role of environmental uncertainty may point to another idea advanced by other scholars, namely that the environmental uncertainty may act as a precursor of environmental scanning rather than a moderator. Previous scholars suggested that the environmental uncertainty and environmental scanning have a linear relationship in which higher environmental uncertainty leads to higher frequency of environmental scanning (e.g., Sawyerr 1993; McGee and Sawyerr 2003). Similarly, Ebrahimi (2000) revealed that the higher level of perceived strategic uncertainty resulted in a higher level of involvement in monitoring task as well as remote environments.

5.1 Theoretical and practical implications

5.1.1 Theoretical implications

The findings of the current study provide a pathway to suitable mechanisms for enhancing resilience in a developing county context. These findings are span boundaries, which enables policy, practitioners, and future scholarly researches (Ikram et al., 2022). Improving the skills for scanning business environments along with the capabilities of changing and transforming internal processes through process innovation are considered the most promising mechanisms for standing resilient in the face of crises such as COVID-19 in Egypt.

Our current study's main theoretical contribution is that it verifies the relationship between environmental scanning and organizational resilience through the mediation of process innovation. Therefore, the manufacturing SMEs should give considerable importance to scanning their external environment to collect information about related events and trends, then using such information to redesign or improve their internal business processes, develop new management approaches, introduce or try new methods of doing things, and take risks to seize and explore growth opportunities. These innovative capabilities can in turn help SMEs to be more ready to face business disruptions with more resilience.

Notably, this study aims to provide seven significant contributions to the organizational resilience literature. First, it fills the knowledge gap concerning the link between environmental scanning and organizational resilience. The literature largely lacks an understanding of the influencing factors of OR (Saad et al., 2021) and how they are working together to achieve resilience. Although previous literature has examined or at least encouraged to examine the impact of ES on OR (e.g., Burnard et al., 2018; Vakilzadeh and Haase 2021;

YhaiaMarzouk and Jin, 2022) and the impact of innovation on OR (e.g., Mafabi et al., 2012; Mafabi et al., 2015; Aulia and Soetjipto, 2021), little to no research has identified how environmental information can be seized to transform current business processes to achieve resilience.

Second, it shows the manner in which environmental scanning affects organizational resilience through process innovation. Our study adds to the extant literature about resilience by proving that merely scanning environment is not enough to build resilience. Instead, how information is translated through process innovation to redesign and/or improve internal processes is more important. This is in line with Barasa et al. (2018) who asserted that organizational resilience relies mainly on the management and utilization of information.

Third, an important implication of this study concerns the application of OIPT. Previous researchers focused on some other theories such as the dynamic capabilities theories, sustainability, and crises management theories to explore the impact of certain variables on resilience (Saad et al., 2020). Our study responds to Saad et al.'s., (2020) call to incorporate new theories to investigate the relationship between OR and its influencing factors by incorporating the OIPT in justifying our hypotheses, thereby opening the door for future research to think the significant role of OIPT in the field of OR.

Fourth, according to Saad et al. (2021), while literature reviews on the resilience of larger organizations and in interrelated disciplinary fields are published, SMEs' resilience has yet to be investigated through empirical research. Besides, the research on SMEs' resilience in developing countries has received, until now, limited attention (Saad et al., 2021). As a result, our current study investigated factors influencing SMEs' organizational resilience within the context of Egypt as an example of a Middle east and an African country simultaneously.

Fifth, the current study demonstrates that environmental uncertainty is unable to moderate the indirect effect of environmental scanning on organizational resilience. This indicates that if SMEs would like to scan their environments to improve resilience, they should do this even in stable times and that organizational resilience is required even in stable times. This finding agrees with Zollo and Winter (2002) who assumed that dynamic capabilities (e.g. OR) are found and utilized even in those environments characterized by reduced change rates.

Sixth: a major challenge to the SMEs especially in developing countries is a difficulty in accessing resources for innovation (Ikram et al., 2022) to face sudden negative events. In this regard, this study is the first study to develop an integrated framework that shows that SMEs in a developing country context can face such crises through paying more attention to accessing environmental information through ES to innovate and withstand crises. It contributes to research about resilience for SMEs operating in developing countries in general and encourages future studies in other developing countries to explore the importance of scanning their environments and updating their existing processes, accordingly, to continue their operations amidst crises and be able to return back to their pre-crisis status.

Finally, Egypt demonstrated exceptional resiliency during the COVID-19 pandemic. The Egyptian GDP growth performance, which was among the few globally that stayed positive in 2020, serves as evidence of this. Egypt is the only MENA nation with a positive forecast for the short term, with GDP growth rates of 2.2% in 2020 and 2.8% in 2021 (IMF, 2020). There are not many researches examining the variables that made Egyptian SMEs more resilient throughout the epidemic, despite the fact that it is evident that Egypt has a solid track record of resilience during the pandemic. Therefore, by illuminating how Egyptian SMEs maintained their resilience during the COVID-19 pandemic through environmental scanning and process innovation, our current study enriches knowledge about Egyptian SMEs.

5.1.2 Practical implications

The current study recommends that managers must establish capabilities for processing information along with adequate environmental scanning to identify, gather, and analyze information about environmental trends that are related to developing innovation and resilience capabilities. Since environmental scanning affected resilience only through process innovation, managers should scan their environments and transfer the information gathered to innovation mangers to translate them into new and/or improved processes that can improve responsiveness to disruption risks.

Moreover, innovation managers must cooperate with senior managers to obtain signals through environmental scanning, assess those signals with business partners, and translate them into strategic insights regarding changes in business environment. Then, it is important to use such interpretation to reconfigure and realign internal resources and processes to effectively respond to environmental disruptions. Besides, Egyptian SMEs should appoint managers responsible for scanning the business environment.

A significant practical implication identified from the study is that our framework can help decision makers, planners, and government agencies develop OR strategies at a country level. The current study provides a new insight regarding the best practices that could be adopted by SMEs managers to maintain their operations amidst crises because Egyptian economy is highly contingent on SMEs. This framework can be incorporated to other developing countries to help explore their readiness towards the mechanisms adopted by Egyptian SMEs to encounter COVID-19 pandemic.

An important insight gained from this study is showing that Egyptian SMEs was able to stand strong in the face of COVID-19 pandemic, thereby encouraging the Egyptian government to pay more attention and provide more financial support to SMEs as they represented a resilient instrument that contributed to maintain a positive Egyptian GDP amidst the pandemic.

The underlying purpose of this study is to identify the mechanisms leading to more resilient SMEs in a developing county context. We, thereby, have provided a foundation for

these mechanisms based on the literature review and prior work in the OR field. Future research can go further and build on this study by developing other variables to help enhance OR by using other methods, such as interviews, case studies or longitudinal studies, to ensure the resilience of their enterprises in light of our methods and results.

6 Limitations

The current study is restricted to manufacturing SMEs. Therefore, we recommend that future studies in the service industry should investigate the relationship between the study variables. Additionally, the study was cross-sectional, meaning it looked at the associations between study variables just once at a specific point of time. Therefore, to capture the trend of results, follow-up studies in a longitudinal design are required. We conducted this study in Egypt. As a result, future research might look at the association between the study variables in different nations to corroborate the findings. Besides, this study was limited to SMEs. Future research can thus be conducted in large-scale enterprises. Finally, we used a survey to collect the required data. However, the survey design methodology is viewed as a means in which a bias occurs towards the organizational members, thereby underscoring the significance of the organizational reality (Erwin and Garman, 2010; Awan and Sroufe, 2022).

Data availability statement

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethics review and approval/written informed consent was not required as per local legislation and institutional requirements.

Author contributions

YM: Writing original draft, writing literature review, collecting data, conducting statistical analysis and writing discussion and conclusion. JJ: reviewed and approved the final version, and supervised this research. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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