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TRANSFORMATION OF INNOVATION PROCESSES DURING THE COVID-19 PANDEMIC: IMPROVEMENT STRATEGIES

Severina Marsovna Khamidova, School of Management, Harbin Institute of Technology, Harbin, China; ORCID: 0000-0003-4515-3521

Yanqing Wang*, School of Management, Harbin Institute of Technology, Harbin, China, yanqing@hit.edu.cn, ORCID: 0000-0002-5961-0482

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* Corresponding Author

ABSTRACT

The importance of innovation processes of organisations has been confirmed by a wide body of research. Hard times brought about as a result of external environment circumstances force organisations to alter their innovation processes. The purpose of this systematic literature review is to track the transformation of organisations by identifying the key strategies that were adopted by these to shape innovation processes during the COVID-19 pandemic. The review was conducted using keyword ("innovation process*" AND "covid") searches in four databases: EBSCO host, Emerald, Science Direct and PubMed. A further systematic approach included the selection of articles based on inclusion and exclusion criteria. The relevant literature was based on scientific articles published in highly rated scientific journals. These articles were then analysed using descriptive and thematic analysis. A total of 13 academic peer-reviewed articles were selected from an initial sample of 566 that were published between 2019 and 2022. The analysis of articles led to the proposition of four strategies that shaped the innovation processes in organisations during the COVID-19 pandemic and can help organisations in the future: rethinking, rapid response, collaboration and openness. The review has some practical implications, that can help management and R&D experts eliminate organisational uncertainties.

1. INTRODUCTION

Innovation is a collaborative process involving internal and external participants of an organisation (Zimmermann et al., 2016). An organisation's innovation process is influenced by: dynamic changes in industries and technologies (Dosi, 1988; Suh & Kim, 2015), and the global market, network, and business environment (Zimmermann et al., 2016; Dziallas & Blind, 2019). With respect to better understanding what constitutes an innovation process, literature from the European Foundation for Quality Management (EFQM) defines it as: a process that is systematically designed and managed (for example, process owners are made aware of their role and responsibility in developing, operating and improving processes, working methods and indicators are clearly defined) (EFQM, 2021). Another camp of researchers define an innovation process as not only the creation process of innovations but also the implementation process (Oke et al., 2009). This systematic literature review adopts the position of the above authoritative sources to inform its definition of the innovation process.

The COVID-19 pandemic has prompted changes in the innovation processes of organisations. The spread of COVID-19 has affected both the global economy and civil society (Sarkar, 2021; Krammer, 2022). Research in the UK shows that domestic organisations in all industries faced difficulties and were forced to reorient production in a short period of time (Liu et al., 2021). Difficulties related to COVID-19 affected production, product design, cooperation and management within Asian organisations.

For example, industrial sector researchers in China found that the level of information exchange during COVID-19 was insufficient for proper response in production and supply chains. Chinese supply chains needed to work on information integration beginning with the upstream of the production chain (Yin et al., 2020). Numerous scholars documented the hard time faced by organisations as a result of COVID-19 (Liu et al., 2021; Viglia et al., 2021). That said, understanding at what stage the innovation process occurs within organisations may help these in decision-making during future hard times.

Studies demonstrate the reactions of organisations to the pandemic and attempt to explain how these survived economic tumultuousness. Although many studies have evaluated the large-scale impact of the COVID-19 crisis on the innovation movement in narrow areas of organisations' field of activity, there is insufficient research related to the direction of organisational improvement strategies during difficult times.

There is a gap in knowledge about comprehensive strategic innovation actions and their potential impact on the successful adaptation of organisations in the initial period of the COVID-19 crisis from 2019 to 2022.

This research gap limits our understanding of how organisations can optimize their innovation strategies and demonstrate more flexible management during contemporary hard times. To address the lack of existing research, it is important to build applicable innovation strategies based on conclusions drawn from research. This study is unique as it proposes a unified set of innovative strategies, which serves to smoothen the transition of organisations during hard times.

The originality and value of the study lie in the unique illustration of the changing strategies of innovation processes during the pandemic in the period from 2019 to 2022. High-quality articles from peer-reviewed journals stored in global and trusted online academic databases (EBSCO host, Emerald, Science Direct and PubMed) were analysed to learn more about the changing innovation processes during the pandemic. The study identifies a set of four innovation strategies that have evolved during the hard times caused by the COVID-19 pandemic.

A systematic literature review methodology was applied to research published over the course of the COVID-19 pandemic offering a comprehensive assessment of relevant studies (Lauzier et al., 2020; Talwar et al., 2020; Ranjbari et al., 2021; Varriale et al., 2021).

The structure of this systematic literature review is organized into four sections. Section 1 explains the methodology. Section 2 outlines descriptive and thematic analyses of the findings in the literature. Section 3 presents a data synthesis. Finally, Section 4 presents a discussion. Section 5 includes practical and theoretical implications, limitations and suggestions for future research.

2. METHODOLOGY

2.1. Choosing a review methodology

This paper adopted a simplified five-step systematic literature review according to the guidelines of Leonidou et al. (2020), Okoli (2015) and Perkmann et al. (2013). A systematic literature review is an important tool to achieve both accurate and reliable synthesis of evidence (Liberati et al., 2009), as well as transparent and replicable procedures (Tranfield et al., 2003; Okoli, 2005). This review includes five steps: question formulation, the definition of review protocols, application of review protocols, analysis of results (descriptive and thematic analysis), and data synthesis. Details related to the above-mentioned steps are described below.

2.2. Question formulation

A systematic literature review requires the formulation of a review question (Okoli, 2015; Leonidou et al., 2020). A good review question sets the foundation for drafting a reliable review protocol. A review question is used to guide the search in online databases and also to guide an extraction process, based on inclusion criteria (Stern et al., 2014). For the purposes of this paper, the review question asks "What key strategies shaped the innovation processes of organisations during COVID-19?".

2.3. Definition of the review protocols

Creating a literature review protocol before conducting a review significantly improves the overall quality of a review (Okoli, 2015). A review protocol consists of inclusion and exclusion criteria. These criteria determine which research articles will be selected and involve five stages (set out below).

In the first stage, four international electronic academic databases were selected (EBSCO host, Emerald, Science Direct and PubMed). These were selected for two reasons. First, they are considered reliable and widely recognized as the top databases in management, business, innovation, and health public science (Zott, 2011; Norris & Ciesielska, 2019; Giorgi et al., 2020; Singh & Sahy, 2020; Azizi et al., 2021). Second, they were accessible to the authors at the time of writing. A literature search time period covered studies published between 2019 and 2022 inclusively, as the COVID-19 pandemic began in 2019. The database search and collection of articles were conducted on March 7th 2022.

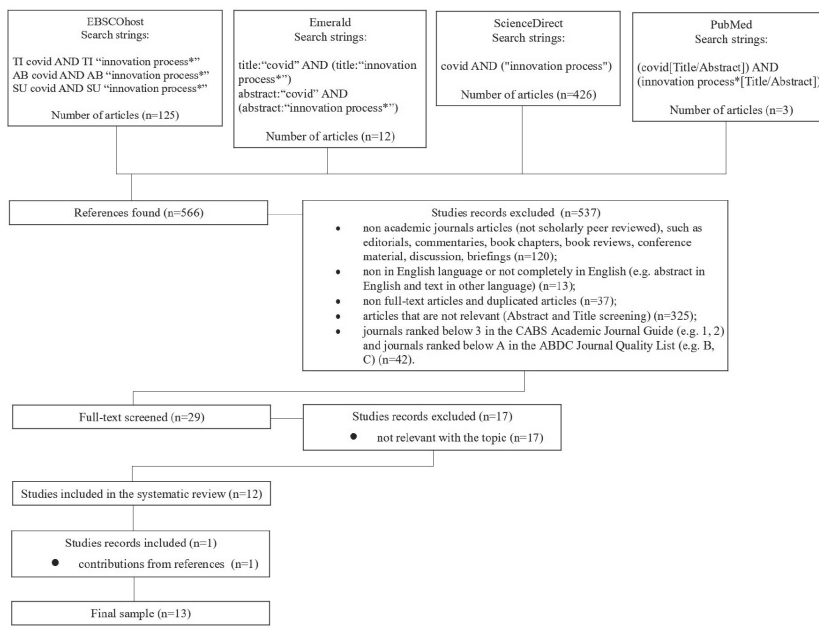
The second stage involved the use of keywords. For the Titles, Abstracts, and Keywords/Subject Terms, the following keywords with the Boolean operator "AND" were used: covid AND innovation process (Figure 1).

The third stage of this review protocol involved selecting articles based on inclusion criteria: publication type and publication language. As per widely accepted practice, articles in the English language and only academic peer-reviewed articles were retained (Ferreira et al., 2020; Shams et al., 2020).

The fourth stage meanwhile applied a set of exclusion criteria. This stage resulted in the removal of articles that were: irrelevant, duplicates, incomplete, or could not be accessed (given the institutional privileges associated with the university-affiliated research account).

Finally, to ensure the quality of the articles that were returned from the search, the analysis filtered articles based on their ranks in both the Chartered Association of Business Schools Academic Journal Guide 2021 (CABS) and the Australian Business Deans Council Journal Quality List (ABDC). Only articles published in journals with 4*, 4 and 3 ratings (according to the CABS), as well as articles published in journals with A* and A ratings (according to the ABDC) were retained (Baldacchino et al., 2015; John & Lawton, 2018; Andrejcik et al., 2021). The methodological applications of these stages for this systematic scoping review are described below.

Figure 1. Process of selecting articles through the different phases of a systematic literature review



Source: Created by the authors.

2.4. Application of the review protocols

After the review protocols were developed, the authors counted relevant articles. A search was performed using the following keywords: TI covid AND TI "innovation process*"; AB covid AND AB "innovation process*"; SU covid AND SU "innovation process*" (EBSCO host); title:"covid" AND (title:"innovation process*"); abstract:"covid" AND (abstract:"innovation process*") (Emerald); covid AND ("innovation process") (Science Direct); and, (covid[Title/Abstract]) AND (innovation process*[Title/Abstract]) (PubMed).

The use of the keywords in the four search engines revealed an initial sample of 566 articles. Non-academic peer-reviewed articles, articles not written in English, as well as duplicates, were all removed resulting in 396 remaining articles. Other types of documents, including executive summaries, conference materials, book sections, graphic analyses and news articles, were excluded from the list of remaining articles, all to enrich the review's validity and quality. All duplicates were found through Zotero software. Another 325 articles were excluded from the remaining sample after screening Titles and Abstracts for review question relevance. This activity resulted in a sample of 71 articles that were retained for further evaluation.

Next, articles that were not included in both the 2021 CABS Academic Journal Guide and the ABDC Journal Quality List were omitted. As a result, a list of 29 articles remained for full-text screening to identify relevant studies. The content of the articles was checked to see whether their themes featured an analysis of how the COVID-19 pandemic affected innovation processes. After full-text scans, only 12 articles were identified as being relevant. Next, as an additional precaution and in order to minimize the possibility of omitting articles from the review, references from among the selected 12 articles were carefully studied. Of the references considered, one article met both inclusion and exclusion criteria and was added to the systematic literature review. This referencing led to a final list of 13 articles. In addition to the above, in order to verify the validity and reliability of the final design of the review protocol and the 13 selected articles, these were critically evaluated by the authors of this review (Okoli, 2015).

3. RESULTS

3.1. Descriptive analysis of the data

At this step of the review, an overview of the main characteristics of the extracted articles was obtained and presented in Table 1. This included the year of publication, author's name, article title, article context, journal title, CABS and ABDC ratings. 13 articles were included in this review and featured the following research and

methodological types: 6 articles were conceptual, 2 were theoretical, 4 employed qualitative methods, and 1 employed mixed methods. With respect to the year of publication of the articles: 23.08% of the articles (n=3 articles) were published in 2020, 69.23% (n=9 articles) were published in 2021, and 1 article was published in 2022. As can be appreciated, the number of articles devoted to the impact of COVID-19 on innovation processes increased significantly in 2021 (nearly tripling the number of high-quality research publications when compared to 2020 output). This result reflects increased interest by researchers in 2021 who sought to better understand how the COVID-19 pandemic affected the development of innovation processes. Having discussed the publication year of the articles in this review, a breakdown of the journals in which they were published can ensue.

With respect to the journals that published the 13 selected articles included in this review, one journal, Technological Forecasting and Social Change, stood out as it published 4 articles. The Journal of Business Research meanwhile published 3 articles and both the Industrial Marketing Management and Information and Organization journals published two respectively. Finally, Research Policy, as well as the Human Resource Management Review, were represented in this review with one article published in each source (see Table 1).

As part of the methodology involved in a descriptive analysis, it is also important to highlight the number of regions studied in each of the 13 articles (Christofi et al., 2017; Leonidou et al., 2020). 5 articles studied the effects of COVID-19 on innovation processes in one region of the world, while two articles evaluated multiple regions. The remaining six articles did not contain region specific information.

It should be noted that of the 13 articles, there was a disproportionate focus on European and Asian continents (5 European samples, 4 Asian samples). In contrast, there was only one sample from North America and Oceania respectively and no samples from Africa, South America or Antarctica. The above trends reflect an uneven geographical distribution and insufficient representation in the study of regions outside Europe and Asia. The ongoing effects of the pandemic confirm the need to conduct research in the under-represented areas.

Table 1. Characteristics of the articles.

No	Year	Author(s)	Article name	Context	Journal	CABS	ABDC
1	2022	Dosi and Soete	On the syndemic nature of crises: A Freeman perspective	The adoption of measures, such as the dominance of an open innovative position and the easing of national regulation on technological sovereignty.	Research Policy	A*	4*
2	2021	Biron, De Cieri, Fulmer, Lin (Veronica), Mayrhofer, Nyfoudi, Sanders, Shipton, and Sun (James)	Structuring for innovative responses to human resource challenges: A skunk works approach	The HR skunk works' approach may help organisations create solutions during hard times. Communication between the organisation and the participants in the skunk works should be permitted, although skunk works should only be used sparingly by an organisation.	Human Resource Management Review	A	3
3	2021	Brem, Viardot, and Nylund	Implications of the coronavirus (COVID-19) outbreak for innovation: Which technologies will improve our lives?	Vision and immediate development of new and practical innovative processes in technologies.	Technological Forecasting and Social Change	A	3
4	2021	Dahlke, Bogner, Becker, Schlaile, Pyka, and Ebersberger	Crisis-driven innovation and fundamental human needs: A typological framework of rapid-response COVID-19 innovations	Innovations, ranging from technological trends to social innovations, are viewed through the prism of nine characteristics of human needs in the first two months of the COVID-19 period. The reaction and needs of society can be based on systematic innovation trends.	Technological Forecasting and Social Change	A	3

No	Year	Author(s)	Article name	Context	Journal	CABS	ABDC
5	2021	Ebersberger and Kuckertz	Hop to it! The impact of organization type on innovation response time to the COVID-19 crisis	Universities are not significantly inferior to startups in responding to innovative changes. Co-operation between innovative startups and established firms can significantly accelerate the innovation processes within the latter.	Journal of Business Research	A	3
6	2021	Mariani and Nambisan	Innovation Analytics and Digital Innovation Experimentation: The Rise of Research-driven Online Review Platforms	Using new online review platforms with productive and beyond-the-obvious forecasting to experiment with digital innovation.	Technological Forecasting and Social Change	A	3
7	2021	Markovic, Koporcic, Arslanagic-Kalajdzic, Kadic-Maglajlic, Bagherzadeh, and Islam	Business-to-business open innovation: COVID-19 lessons for small and medium-sized enterprises from emerging markets	The ability to quickly find a business partner plays a key role in increasing the flexibility of the organisation.	Technological Forecasting and Social Change	A	3
8	2021	Oborn, Philosophy, Hinings, and Zimlichman	Institutional logics and innovation in times of crisis: Telemedicine as digital 'PPE'	The priorities of institutions (including: state, corporation, profession, family) vary but all of them aim to solve issues that come about because of COVID-19.	Information and Organization	A*	3
9	2021	Orlikowski and Scott	Liminal innovation in practice: Understanding the reconfiguration of digital work in crisis	Continuous learning using the liminal innovations while confronting difficulties (pragmatic, tactical, and existential), is beneficial.	Information and Organization	A*	3

No	Year	Author(s)	Article name	Context	Journal	CABS	ABDC
10	2021	Viglia, De Canio, Stoppani, Invernizzi, and Cerutti	Adopting revenue management strategies and data sharing to cope with crises	A high degree of data exchange and open cooperation between hoteliers (fueled by mutual benefit) are key factors of efficiency and crisis resilience.	Journal of Business Research	A	3
11	2020	Cankurtaran and Beverland	Using design thinking to respond to crises: B2B lessons from the 2020 COVID-19 pandemic	Design thinking approach with three stage innovation process used by B2B firms. This approach is applicable both in the B2C firms and in the B2B firms.	Industrial Marketing Management	A*	3
12	2020	Chesbrough	To recover faster from Covid-19, open up: Managerial implications from an open innovation perspective	To accelerate the innovation process and recovery after the pandemic, it is necessary to respond openly and creatively to the pandemic and share knowledge without being limited by foreign borders and nationalities.	Industrial Marketing Management	A*	3
13	2020	Wang, Hong, Li, and Gao	Marketing innovations during a global crisis: A study of China firms' response to COVID-19	The choice of one of four marketing innovation strategies depends on the characteristics, resources, capabilities of the organisation and the type of communication with customers.	Journal of Business Research	A	3

CABS-Chartered Association of Business Schools Academic Journal Guide 2021, ABDC-Australian Business Deans Council Journal Quality List.
Source: Created by the authors.

3.2. Thematic analysis of the data

Having completed a descriptive analysis of the 13 articles, it is now appropriate to turn to a thematic analysis of the findings. A thematic analysis helps highlight key strategies that were discovered in the 13 articles about how firms responded to hard times brought upon them by the COVID-19 pandemic. Oke et al. (2009) point out that innovation processes consist of an early creative stage and the process of implementing

innovations. Therefore, a broader approach to identifying strategies has been applied. Based on this, the literature was classified depending on the generation of ideas, the development of the concept and the possibility of idea implementation. These strategies include: rethinking, rapid response, collaboration and openness. Details about each strategy are outlined below.

3.3. Data synthesis

3.3.1. Rethinking

As a result of the hard times brought on by the COVID-19 pandemic, organisations have adopted rethinking as a strategy to adapt their innovation processes. The following is an overview of articles that featured a focus on the rethinking adopted by organisations.

Articles that discussed rethinking strategies found that rethinking prompted organisations to adopt new processes. For example, Cankurtaran and Beverland (2020) emphasized that given the complexities and scale of effects that are the result of the pandemic, organisations are forced to rethink their innovation processes. This means that organisations must destroy the usual norms and ways of thinking and open the way to new opportunities (Cankurtaran & Beverland, 2020; Orlikowski & Scott, 2021). Cankurtaran and Beverland (2020) also defined a three-stage process of design thinking by organisations: disrupt, develop & deliver, and transform.

The disrupt stage involved the destruction of habitual thinking, as well as working through problematic issues (Cankurtaran & Beverland, 2020). Similarly, field research concluded that focusing on thinking about problems in a different way has helped organisations open up new possibilities in innovation processes (Orlikowski & Scott, 2021). This echoes the finding by Biron et al. (2021) about the necessity to create an isolated group within organisations to develop innovative solutions related to product and social markets.

In the second stage meanwhile, development opportunities for innovation processes are identified (Cankurtaran & Beverland, 2020). Research has noted that development opportunities and motivation for innovation were found to depend on the resources of the organisation and its capabilities to innovate independently (Wang et al., 2020). If an organisation has enough resources, it will solve problems and come up with innovations independently. Conversely, if an organisation does not have sufficient resources, then it will have more motivation to cooperate with other organisations to develop innovations (Wang et al., 2020). Cooperation, however, does not guarantee active and optimal financial assistance to ensure that the innovation-related outcomes of a particular organisation are met (Biron et al., 2021). Other scholars meanwhile noted that the development of an innovation strategy has been found to

depend on the degree of employee buy-in and employee adaptability (Ebersberger & Kuckertz, 2021).

The third stage meanwhile is characterized by the re-stabilization of the innovation process in an organisation (Cankurtaran & Beverland, 2020). Research has confirmed that organisations move from experimenting with innovations to eventually using these (Orlikowski & Scott, 2021).

The COVID-19 pandemic has forced organisations to create new norms that require design thinking (Cankurtaran & Beverland, 2020). This is in line with the finding by Orlikowski and Scott (2021), who noted that it is necessary for organisations to not only change their thinking when faced with challenging times but also to do so constantly and develop such a capability with the help of liminal innovations (endless development of innovations based on each other).

3.3.2. Rapid response

The second key strategy found in this systematic literature review is rapid response. Below is an overview of articles containing an analysis of rapid response strategies to the innovation process in the context of the COVID-19 pandemic.

Ebersberger and Kuckertz (2021) noted that the response time to changes in the innovation landscape varies depending on the type of organisation. These authors concluded that the relative age of some companies led them to be more flexible than others. For example, the response time in start-ups was shorter than in established firms, which confirms that size was key to the innovation process. It can be concluded that startups have more time to conduct and test various innovations and, therefore, have a bigger chance to survive and gain unique competitive features.

Rapid response was also found to be important to organisations in a study of large firms in China (Biron et al., 2021). Central to the rapid response of the firms in China were approaches that adopted "Skunk works". Skunk works are defined as "flexible groups empowered to work rapidly with minimal management constraints, to address technological challenges" (Biron et al., 2021, p. 1). It was found that by implementing skunk works, large firms reduced the time required for research and development of technological innovation products and services. Such skunk works, like other structural approaches, have allowed firms to develop faster, thereby changing an incremental trajectory into a radical one. Moreover, the inclusion of skunk works in the organisational structure allowed organisations to prevent potential threats to its activities (Biron et al., 2021). This is consistent with findings that innovations were forced to be more radical during COVID-19 (Brem et al., 2021). Moreover, thanks to digital infrastructure, innovative processes could move forward with greater speed (Brem et al., 2021).

Other research meanwhile has noted that in addition to the correct use of approaches serving to accelerate the innovation process, a rapid change in the choice of

external partners can help achieve the same goal (Markovic et al., 2021). Markovic et al. (2021) noted that the rapid change in the choice of external partners during COVID-19 helped firms generate innovations. This is consistent with the finding that during the pandemic, firms were required to adopt approaches to develop rapid prototypes which they had previously not considered (Brem et al., 2021). The above findings together confirm the importance to an organisation of a rapid response in order to change their innovation processes during hard times.

3.3.3. Collaboration

The third key strategy that shaped the innovation processes of organisations during COVID-19 is collaboration. Research determined that the COVID-19 pandemic changed the innovation process of organisations by motivating stakeholders to collaborate (Viglia et al., 2021). Viglia et al. (2021) found that collaboration in the hotel industry is flourishing. Moreover, hoteliers are more willing to adopt a digital management strategy. The strategy of collaboration allowed firms to both introduce more innovations (Dahlke et al., 2021) and maximize profits (Viglia et al., 2021). The tendency for firms to collaborate during COVID-19, provides support to the assertion by Dahlke et al. (2021) that the choice by firms to act as allies was due to their recognition that doing so was more effective than acting in isolation.

The importance of collaboration as a strategy that shaped the innovation processes of organisations is in line with Markovic et al. (2021), who noted that the COVID-19 pandemic had strengthened the collaborative mindset of SMEs. Markovic et al. (2021) also found that firms during the pandemic were ready to cooperate with other private firms and customers. This readiness by organisations to shift from collaborating with government bodies to working collaboratively with private firms however came with a caveat; it largely depended on overlapping interests (Markovic et al., 2021). Moreover, additional research pointed to organisations collaborating when they determined that a potential organisation was the right business partner (Markovic et al., 2021) and had sufficient existent resources (Wang et al., 2020). The willingness to collaborate with other organisations is therefore something that was largely influenced by a variety of factors.

3.3.4. Openness

Finally, the fourth key strategy that was found in the literature review is firm openness (defined as an organisation's willingness to share knowledge) (Chesbrough, 2020). The importance of firm openness in innovation processes was mentioned in most articles selected for analysis in this review. Numerous articles underscore that digital innovations contribute to an open innovation culture (Mariani & Nambisan, 2021;

Oborn et al., 2021; Dosi & Soete, 2022). Hard times, such as the COVID-19 pandemic, pushed firms to work remotely and use online review platforms, which, in turn, contributed to the acceleration of innovation processes (Mariani & Nambisan, 2021). Chesbrough (2020) also found that openness accelerates the internal innovation process. Other research meanwhile has noted that openness enhances the creative potential of organisations (Oborn et al., 2021), generates more experiments and knowledge (Chesbrough, 2020), as well as promotes the spread of innovation (Viglia et al., 2021; Dosi & Soete, 2022). Accordingly, organisations who wish to be successful during hard times should both maintain their openness (Ebersberger & Kuckertz, 2021; Dosi & Soete, 2022), encourage open science (Dosi & Soete, 2022), find creative approaches to open innovation, transform some of the processes if necessary (Chesbrough, 2020), and motivate stakeholders to exchange data (Viglia et al., 2021).

4. DISCUSSION

The effects of the COVID-19 pandemic have brought about significant changes in the innovation processes of organisations that sought to thrive. A systematic literature review was necessary to better understand the various innovative processes adopted by different organisations. The review sought to answer the following question: "What key strategies shaped the innovation processes of organisations during COVID-19?". The review thus offers an analysis and discussion of the key strategies of innovation processes in organisations during the COVID-19 pandemic.

The literature review shows that organisations should not only focus on a single way of improving their innovation processes (Orlikowski & Scott, 2021), but highlights the importance of open continuous learning by organisations, and requiring these to be both ready and motivated to do so. Organisations who wish to rapidly develop their innovation processes during hard times, like the COVID-19 pandemic, should overcome resistance to change (Biron et al., 2021). The findings of the review confirm the challenge of organisational resistance and indicate the need for organisations to consider adopting follow-up supportive and developmental strategies.

The findings of the review demonstrate that organisations should be nimble in choosing the right business partner (Wang et al., 2020; Markovic et al., 2021; Viglia et al., 2021), as well as be ready to share their achievements openly (Chesbrough, 2020; Ebersberger & Kuckertz, 2021; Mariani & Nambisan, 2021; Dosi & Soete, 2022). The articles in the review also revealed that organisations should be more technologically flexible (Biron et al., 2021; Brem et al., 2021; Dahlke et al., 2021; Oborn et al., 2021) and ambitious (Brem et al., 2021; Orlikowski & Scott, 2021) while adopting an agile operational management style (Mariani & Nambisan, 2021).

This review distinguishes itself from the 2021 review conducted by Liu et al. in an important way. Notably, it weighs the importance of organisations collaborating with business partners who are focused in the same area of interest and have sufficient

resources and openness to share information. While the study by Liu et al. (2021) found that accelerated innovations depend on product complexity and manufacturing structure, it did not include aspects of collaboration and openness. These two factors were key in helping organisations that were rethinking and developing rapid response strategies during the COVID-19 pandemic.

In addition, there are similarities in the strategies found in the review by Zimmermann et al. (2016) and this review. Both reviews emphasize the value of open innovations based on trust and frequency of exchange. There are, however, important differences in the other strategies. The strategic approaches in Zimmermann et al. (2016) are narrowly focused on supply chain management. The approaches relate to specific partnership and cooperation, projects and integration. The current review meanwhile draws from the experiences of organisations in human resources, business start-ups, hotels and industrial fields.

This literature review has focused on identifying broad-based universal key strategies that were adopted by organisations as a result of encountering unexpected difficult times. This literature review traced new innovative processes that arose as a result of the pandemic. These were classified into four strategies. The key strategies include: rethinking, rapid response, collaboration and openness. Such strategies could help create a more secure and promising future for organisations. These key strategies are a beacon to managers in difficult times. This is because strategies help managers reorganize the innovation process, not only from the inside but also in the outward facing organisational activities.

5. CONCLUSION

5.1. Theoretical and academic implications

This study adds to existing theories and proposes a new theory for further testing. The identified key strategies can serve as a basis for organisations working to support core processes, as they allow organisations to understand and adapt successive stages of a new management process. Researchers must consider all four strategies when evaluating the innovation processes that organisations undertake, and also need to continue analysing and developing strategic categories in subsequent research. Future research should take into account peer-reviewed articles from highly qualified academic journals ranked above 3 in the CABS and above A in the ABDC and draw a parallel between the present investigation and subsequent findings identified after March 2022.

5.2. *Practical implications*

The paper provides a summary of the existing literature and constitutes a unique contribution to the field given that such work has not been realized at the time of writing. The paper also proposes four strategies for innovation processes that can be considered by organisations who are needing to navigate uncertain conditions and must adapt or die. Leaders of organisations may thus refer to this article to help guide their reflections and courses of action.

It provides management experts with a valuable understanding of the current trends of innovation process transformation. As outlined, since the needs of business and society differ at the institutional level, firms would be wise to empathize with the priorities of different stakeholders. If necessary, firms should create separate groups that can narrowly focus on specific tasks related to those priorities.

Managers within organisations would also be wise to encourage open collaboration between employees and support contributions by employees in different areas of the organisation when possible. At the same time, it is vital for firms to develop rapid responses to changes and ensure that human capital remains qualified to adapt to such changes.

The key strategies are suitable for human resource managers, innovation managers, crisis managers, small and medium-sized enterprises, hotel owners, startups, established firms and institutions. More specifically, managers could incorporate key strategies to enhance the performance of both employees and their organisation. Moreover, they could consider key strategies in light of the purpose, mission, values, objectives and structure of their respective organisations and update these in accordance with the key strategies. Managers could also adopt these key strategies when reconsidering organisational policy. With respect to innovation managers, these should be open to receiving and sharing innovative ideas in partnership with internal and external stakeholders. Use of the key strategies, could help startups increase the productivity of their work on projects, which could allow them to reach investors early to fuel their growth.

5.3. *Limitations and future research*

This literature review has several limitations. Firstly, due to English being the most popular language of research and academic peer-reviewed articles (O'Neil, 2018), articles not in the English language were not included in this review. Secondly, researchers only had access to the databases approved by their research institution. This means that only four databases relevant to the research effort were accessible (EBSCO host, Emerald, Science Direct and PubMed). Thirdly, geographical representation of the accessible research was limited. Most notably, there was no research discovered for the African, South American and Antarctica regions. Finally, there were limited

numbers of articles included in the research. This was due to the relatively limited number of articles that were published at the time of the research undertaking.

The above limitations may be overcome by future research undertakings. Firstly, articles in languages other than English could be included. Secondly, the use of other databases could help uncover other articles which could reveal new innovation processes (which may not have been included in the 13 articles that were selected for this review). Thirdly, future research could seek to better understand innovation strategies adopted by organisations in understudied regions, such as Africa, South America, or Antarctica. This could be a valuable area of future research given that regions differ in their levels of wealth, medical care and culture, which could mean that innovation processes adopted by organisations during the COVID-19 pandemic could vary significantly (Giorgi et al., 2020). Lastly, this sampling informed a new theory on key strategies for innovation but research after March 2022 was not included. Future research should consider reviewing new research undertakings as they become available to determine whether this phenomenon will become a long-term trend and if theoretical changes might need to be made based on research realized after March 2022.

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DISCLOSURE STATEMENT

The authors report there are no competing interests to declare.

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