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## Article

# Investigating the effects of the COVID-19 pandemic on medical device strategy and firm performance

Technology audit and production reserves

*Reference:* Msweli, Buhlebenkosi Lunga/Chili, Muntuwenkosi et. al. (2022). Investigating the effects of the COVID-19 pandemic on medical device strategy and firm performance. In: Technology audit and production reserves 5 (4/67), S. 6 - 15.

<http://journals.urau.ac.za/article/download/267191/263146/616620>.

doi:10.15587/2706-5448.2022.267191.

This Version is available at:

<http://hdl.handle.net/11159/12818>

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## INVESTIGATING THE EFFECTS OF THE COVID-19 PANDEMIC ON MEDICAL DEVICE STRATEGY AND FIRM PERFORMANCE

*The object of study is the importance of medical technology and healthcare delivery in the COVID-19 pandemic.*

*The COVID-19 pandemic has caused many changes to the business, healthcare, and societal landscape. The changes have had varying effects on key industries, demanding them to realign to fit new pandemic-imposed environmental conditions. This study seeks to investigate the effects of the COVID-19 pandemic on medical device strategy and firm performance of company X, and to provide recommendations and insights on strategies to ensure continuity post-pandemic. A qualitative analysis of the results from nine interviews with associates regarding the effects of COVID-19 on firm performance and strategy at company X was explored. The findings from a thematic analysis of the interview data are reported and related to the study's research objectives. Findings showed that the COVID-19 pandemic forced company X to adjust its strategy to align it with the changing environment. However, the data showed that the unknown nature and uncertainty of the COVID-19 pandemic environment meant that the realignment of strategy to the prevailing dynamics was unique. This study's key findings indicate that COVID-19 strongly influenced financial performance, which influenced firm performance significantly. In addition, financial performance measures were found to have more impact than non-financial performance measures such as strategic performance. The main recommendation emanating from the study was to improve the organization's agility, versatility, and speed. This would be achieved through simplifying processes, streamlining decision-making, and enhancing speed in the market. Agility and versatility are necessary to overcome or take advantage of new developments from the pandemic and post-pandemic environment.*

*This research study can assist medical enterprises in other countries to stream their services and align strategy to meet the dynamic environment caused by the COVID-19.*

**Keywords:** COVID-19 pandemic, economic effects, health care, medical device strategy, firm performance.

Received date: 18.10.2022

Accepted date: 15.11.2022

Published date: 16.11.2022

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### How to cite

Msweli, B. L., Chili, M., Madzimore, J. (2022). Investigating the effects of the COVID-19 pandemic on medical device strategy and firm performance. *Technology Audit and Production Reserves*, 5 (4 (67)), 6–15. doi: <https://doi.org/10.15587/2706-5448.2022.267191>

## 1. Introduction

The COVID-19 pandemic has had a far-reaching economic and socio-economic impact globally, which has caused significant changes to how society operates. Governments have implemented different interventional factors to control the spread of the virus [1, 2]. The COVID-19 pandemic and subsequent responses had varying impact on the business environment, which has led to the evolution of the new normal. Companies are encountering transformed business processes, value chains and markets. The pandemic has also opened new opportunities. Businesses are developing innovative ways to build on resilience during the heightened uncertainty of the pandemic's epicenter shifts from region to region [3]. Medical technologies play a crucial role in the South African healthcare system as they offer better screening, diagnosis, treatment, and monitoring

of health indicators. The COVID-19 pandemic has put the medical device industry at the forefront of the battle with the global disease, with an unprecedented demand for medical technologies such as diagnostic tests, ventilators, and personal protective equipment [4]. Within the National COVID-19 policy framework, many medical device firms, such as company X, initially focused on the immediate crisis response: keeping employees safe, ensuring business continuity, and dealing with the rapid changes in the healthcare ecosystem [4]. However, the location and structure of healthcare delivery have changed significantly for many healthcare institutions. Healthcare providers are reassessing how they deliver care, how physicians interact with patients and how best to procure supplies [1].

Company X is a global medical technology company involved in developing, manufacturing, and selling medical supplies, devices, laboratory equipment, and diag-

nostic products [5]. It is a prominent provider of medical technologies in South Africa's private and public sectors. The development of the COVID-19 Pandemic has underscored the importance of medical technology and healthcare delivery. Policies implemented to mitigate the COVID-19 pandemic have caused many changes to the business, healthcare, and societal landscape. The changes have had varying effects on key industries, demanding them to realign to fit new pandemic-imposed environmental conditions [6, 7]. The COVID-19 pandemic is a case of a powerful external determinant of strategy and firm performance as it has significantly impacted businesses' processes and operations [8]. [9] suggests that organizations are related to their external environment; thus, their goals, objectives, resources, processes, and capabilities should be coordinated with the external environment containing competitors, customers, and partners. [9] notes that since the modern world is dynamic and turbulent, performance measures need to be revised or adapted to the changes in either the business environment or the business strategy. The COVID-19 pandemic presents a unique series of uncertainties for organizations; therefore, the indicators and measures relevant for evaluating performance must be determined [10]. The recent research features the broad societal and economic impacts of the COVID-19 pandemic on institutions, financial markets, and government policy [9]. Business research commonly focuses on how businesses have responded to the extraordinary scale of the pandemic crisis by investigating the challenging strategic decisions such as assessing public health and worker protections against operational costs and financial returns. The suspension of operations, business activities disruptions and firms' closures are also among the most reported [6]. Currently, limited academic studies that consider the impact of COVID-19 on firm performances and medical device strategy.

## 2. The object of research and its technological audit

*The object of study* is the importance of medical technology and healthcare delivery in the COVID-19 pandemic.

Medical technology businesses play a pivotal role in the South African healthcare system as they afford improved healthcare outcomes [11]. The South African health system has been burdened with COVID-19 pandemic response over and above existing challenges in healthcare service delivery. COVID-19 factors have changed the structure of healthcare delivery in South Africa [12]. However, limited research has been done to assess the implications of COVID-19 policy responses for healthcare technology and medical devices companies' performance and strategy [13]. This poses new challenges as medical device companies attempt to adapt and effectively incorporate the business strategy to support the changes in healthcare services and delivery [8].

## 3. The aim and objectives of research

*This study aims* to investigate the impact of COVID-19 pandemic factors on medical device strategy and firm performance of company X. It provides recommendations to management with insights on strategies to ensure continuity post-pandemic.

To achieve the aim, the following objectives are set:

1. To identify what aspect of the COVID-19 pandemic affected employees' ability to do their work to achieve the organization's goals and objectives at company X in Gauteng province.
2. To examine what effects do the COVID-19 pandemic has on medical device strategy at company X in Gauteng province.
3. To examine what effects do the COVID-19 pandemic has on firm performance at company X in Gauteng province.
4. To recommend strategies to address the effects of the COVID-19 Pandemic on delivering healthcare technology services at company X in Gauteng province.

## 4. Research of existing solutions of the problem

[13] defines strategy as creating a unique and valuable position involving different activities. [9] describes strategy as the procedures and systems to achieve the organization's goals and objectives while remaining competitive. [4] defines strategy as a set of managers' decisions and actions to earn superior business performance compared to rivals. Definitions of strategy in business commonly relate to how management plans and allocates resources to achieve goals and objectives essential to the success and survival of business entities [11]. Other definitions relate to achieving a competitive advantage or realizing superior performance, which is operational effectiveness. However, [13] distinguishes that strategy is not necessarily operational effectiveness, although both are essential to superior performance. While operational effectiveness is about realizing excellence in specific activities, or functions, strategy is about combining activities. Ultimately, business strategy coordinates the organization's needs and the actions that contribute to value creation. Thus, [7] defines strategy as «a combination of deliberation and impulsiveness on the base of new and past ideas and actions».

[7] posits that strategies can be deliberately developed, or they can emerge organically. However, strategies are not formed absolutely; neither can they be absolutely planned, nor are they purely realized. An effective business strategy defines a scope, direction and how to achieve desired performance and sustain competitive advantage. [14] defines the five Ps of strategy: plans, patterns, positions, perspectives, and ploys. Each P is an approach to strategy that illustrates what drives a successful strategy. These factors are interdependent and intercalated. They interact to form the context within which strategies are implemented. Plans are predetermined operations and thus be future actions.

Patterns are unexpected models or actions that develop from repeated behaviour over time [7]. Positioning is the space that a product holds within markets. Perspective describes how firms view and perform specific actions. At the same time, ploy refers to tactics used by the firm [7]. [3] differentiate three central points concerning strategy: value creation is the primary objective of a company structure. Secondly, modern organizations are commercial entities that operate in distinct markets separated vertically and geographically. Lastly, a company needs a framework to harmonize its operations and manage different components of its business [15]. Ultimately, by having a business strategy, management has a protocol of

how an organization can correspond to the situation and what choices need to be made to enhance performance [8].

Firm performance is determined by how effectively and efficiently the firm's business strategy is organized and executed [2]. Performance is the aspiration of any organization since it ensures that businesses experience development and growth [8]. [10] note that there is no universally recognized definition of what performance is at the level of an individual firm. However, [12] posit that describing performance is crucial, as this serves to discern between antecedents and performance results. Historically, firm performance was framed by concepts such as efficiency and effectiveness. Various authors defined performance as organizational efficiency and, sometimes, productivity. Twenty-first-century definitions are primarily concentrated on a business's capacity and capability to use resources to efficiently accomplish set organizational objectives and stakeholder considerations [14]. [16] defines firm performance as the capacity of a business to apply its resources effectively while producing outputs aligned with its objectives and are essential for its stakeholders. Furthermore, the performance of an organization is closely linked to the goals and objectives it wants to achieve. Thus, specific performance elements need to be defined and agreed upon by the organization [16]. Similarly, [17] postulates a close link between the concepts of organizational objectives and organizational performance. Businesses presumably strive to achieve predetermined objectives with the resources available. Thus, organizational objectives and resources can be viewed in the definition of organizational performance.

## 5. Methods of research

A qualitative approach was selected for this study because the study sought to explore and interpret the impact of pandemic policies on medical device companies based on the experiences of company X associates. A sample of 9 participants were selected for this study and interviewed via both face to face and online. The thematic analysis which was employed for this study aims to understand the patterns of meanings in data on perception and experiences. The analysis best suits qualitative research methods, such as narrative and interview methods.

[18] posits that a qualitative investigator must assure participants have freedom of choice regarding involvement in the study, that participants' identity is protected throughout the enrolment and publication process, and that precise and precise genuine research is reported. A research ethics committee reviewed the ethical considerations of this study at MANCOSA College, and ethical clearance was received before the research began. This study followed general ethical guidelines that ensured consent, no harm to participants, permission, confidentiality, and anonymity. Participants were not forced to participate in this study and could withdraw at any given time should they wish to. No incentives were given to participants to complete the survey.

## 6. Research results

**6.1. Sample Characteristics.** A total of ten interviews were conducted; one interview was removed at the participant's request as they revoked their consent. Thus, nine interviews made up the sample that was used for the thematic analysis.

Department signifies the area of speciality of the participants within company X. Participants with different roles from different departments were chosen to increase the diversity of perspectives and to ascertain a broader view of the topic. Table 1 shows the number of participants from each department.

**Table 1**

Department	
Department	Number of participants
Sales	5
Technical services	2
Clinical	2
Total	9

The nine participants were purposively sampled from the sales department responsible for the sales of medical devices, technical services that services and repairs medical devices and clinical, who are responsible for medical and clinical aspects surrounding medical devices.

The job titles of the participants are shown in Table 2.

**Table 2**

Job Title	
Job Title	Number of participants
Business Development Manager	2
Clinical Resources Manager	1
Back Office Team Lead	1
Professional Sales Consultant/Representative	3
Clinical resource Consultant	1
Field Service Engineer	1
Total	9

Job titles represent the roles of the participants within company X. Three participants were managers who formed part of their respective business units' extended leadership team. One participant was a team leader of a business function, and the remaining five participants were mid-level associates reporting to managers and team leaders. A wide variety of roles were chosen to get the broadest range of impacts, both at the managerial and staff levels of the organization. All the roles are aware of and directly involved in the strategy execution regarding medical device healthcare delivery at company X.

Years of experience are shown in Table 3, and they signify the length of service of the participant within the medical devices industry.

**Table 3**

Years of experience	
Years of Experience	Number of Participants
5-10	2
11-15	3
16-20	3
21-25	1
Total	9

Seven out of the nine participants had more than 11 years of experience, and of those seven participants, four had more than 16 years in the medical device industry. The study considers that more insight can be gained from more experienced participants.

**6.2. Thematic Analysis Results.** This section presents the results from the thematic analysis. Raw data from the analysis was used to form codes; then, these codes were used to form themes and thematic maps that ultimately lead to interpretations [19]. The data is presented with thematic maps for each research objective.

**6.2.1. Customers.** The first research objective of this study was to identify what aspects of the COVID-19 pandemic affected employees' ability to do their work to achieve the organization's goals and objectives at company X. The central theme found from the thematic analysis was that of «customers», which can be seen in Fig. 1.

Further analysis found two sub-themes related to the central theme: access to customers and customer relationships. These themes were based on prominent codes identified amongst various participants. The theme of being unable to reach and connect with customers at an intimate level, like face-to-face is predominant across most of the study's collected data.

**6.2.1.1. Customer Relationships.** The sub-theme of «customer relationships» was mainly driven by participants reporting that customer relationships have changed due to the COVID-19 pandemic. Furthermore, the sentiment was predominantly negative. Participants reported challenges with engaging with customers, mainly driven by having to facilitate it digitally. As seen in the examples below.

Participant 8: «You had to obviously interact with customers or interacting with clients or potential customers digitally instead of face to face. There is no travel; it's harder to forge relationships or to keep relationships with your customers...».

Participant 4: «Creating relationships with customers, and keeping any user or whoever. You literally cannot do it over the phone or on a team's meeting. So it felt like you lost your connection with a customer or with a key opinion leader».

Participant 3: «Working online most of the time, getting used to teams and whatever online platforms you had to engage with customers, also, from a customer perspective, not being able to see them during that time, but having all your conversations online, was a different dynamic».

The coded interview data also shows that the restrictions have significantly affected the ability of associates to engage with customers, forge customer relationships or maintain them. [7] suggests that access to customers may remain partially restricted as healthcare systems seek to recover financially and are likely to be cautious with expenditures. This is expected to affect medical device strategy and firm performance.

**6.2.1.2. Access to customers.** The sub-theme of «access to customers» suggested that travel restrictions stemming from lockdowns were the main influences that affected employees' ability to work to achieve the organization's goals and objectives. Many employees were restricted to their homes at the peak of the pandemic. A [20] survey of 229 human resources departments determined that just less than half of the organizations studied had over 80 % of their employees working from home in the initial period of the COVID-19 pandemic. In June 2021, an estimated 50 % of the South African workforce was still working from home full-time [21]. The code «lockdown restrictions» or «travel restrictions» was very prominent in the data.

Three examples can be seen below.

Participant 2: «Restrictions in terms of travel, because I'm local. I'm currently looking after the rest of Southern Africa and with COVID restrictions, we had limitations in terms of reaching customers».

Participant 5: «The hard lock down we had and also the restrictions from company X during the lockdown that also stopped us from going out and having face to face contact, which is our day to day task».

Participant 7: «We were restricted to travel. So, it has affected my day to day job (...) My day to day job involves customer face to face so I could not see customers and that has also affected our numbers, our sale».

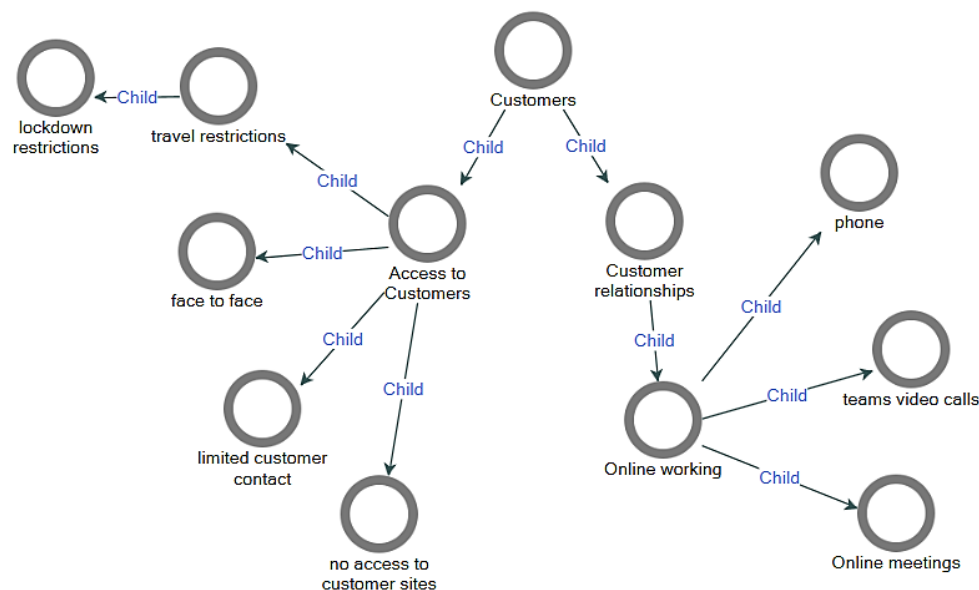


Fig. 1. Thematic map of codes and themes relating to research objective 1



Data further suggested that for most participants', travel and having direct contact with customers is part of their daily tasks. This finding underscores the importance of medical device companies' direct contact with healthcare institutions. The results were consistent amongst most participants, whether the associate was a manager or not. They further highlight customers' importance in the medical device industry. [22] posits that healthcare providers have high expectations for products and services to ensure that the medical device meets their needs. The authors further suggest that engagement with users is critical for medical device technologies because the position of users concerning devices allows them better to judge the performance of pharmaceutical products or medical devices and thus separate complications encountered in their use. This may explain why the participants were unable to achieve their goals and objectives. Their work with customers is an intrinsic part of how the organization operates. COVID-19 thus had a significant impact in this regard.

**6.2.2. Adjusting strategy.** The central theme found from the thematic analysis of research objective 2 was the theme of how company X adjusted its strategy, which can be seen in Fig. 2.

Further analysis found three sub-themes related to the central theme: The changing environment, Change in spending and digitalization. These themes were based on prominent codes identified amongst various participants. The thematic analysis showed that COVID-19 forced company X to adjust its strategy to align with the prevailing COVID pandemic environment.

**6.2.2.1. Changing environment.** The prevailing environment was full of uncertainty and unknowns as a Pandemic of the magnitude of COVID-19 had never been seen before. In this light, the organization was reported to be slow to market, and opportunities were missed. Participants noted how COVID-19 forced company X to adjust its strategy, as seen below.

Participant 2: «They had to adjust the strategy as well and align it to the changing environment».

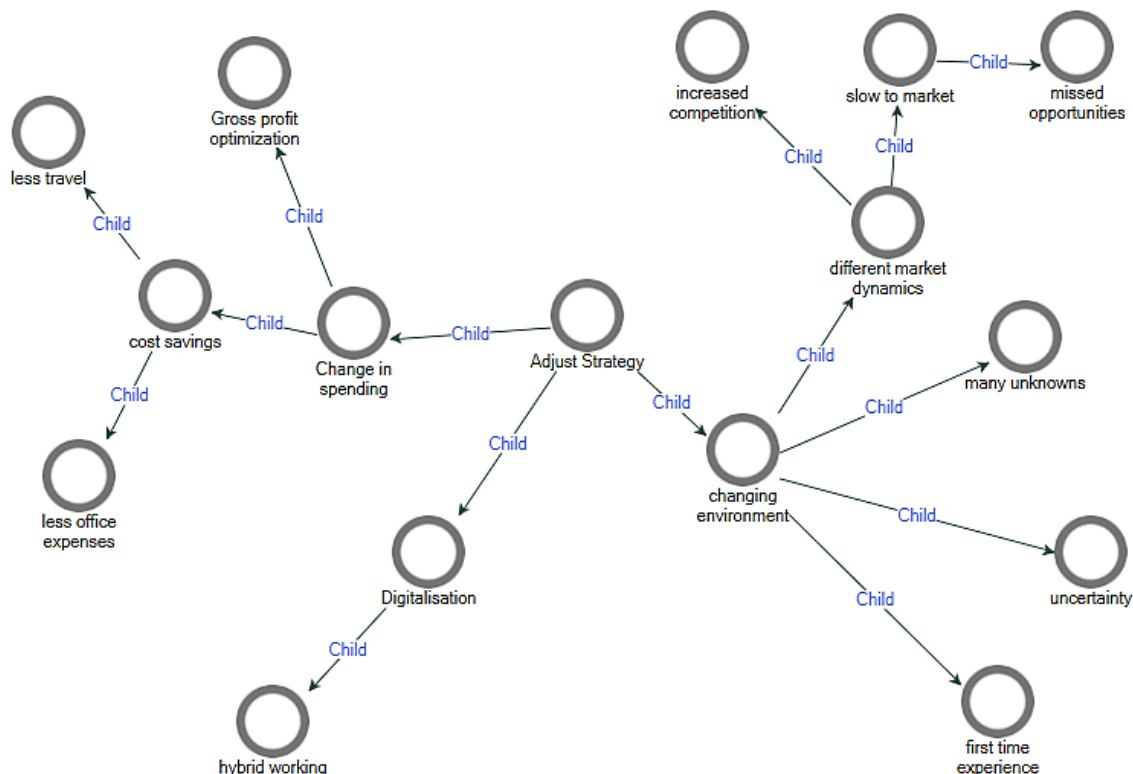
Participant 4: «Business Strategy wise (...) I think we had to do a lot more thinking about what do we do in like a pandemic, it's something that never happened before. So I think it changed our mindset on setting strategies».

Other participants noted negative aspects regarding how BD adjusted its strategy. The main criticisms were how slow the organization was in the market. The organization missed opportunities because of the lack of agility.

Participant 6: «I don't think there was a clear COVID-19 strategy or whatever strategy we had; it was late to market because we didn't get to market as early as possible, like the other big diagnostic companies. And once you are late, your strategy is affected because you don't get take for the market. Because the other players have already consumed the market».

Participant 8: «...point of care testing And I think that's kind of like a missed opportunity there. The strategy was there to sort of have it in the market, but we never really got it off the ground».

At the start of the pandemic, many medical device firms, such as company X, initially prioritized immediate crisis response: keeping employees safe, ensuring business continuity, and dealing with the rapid changes in the healthcare ecosystem [6]. This may be why the organization was late to market for some products; organizations may have prioritized stabilizing other business aspects. The market speed could also be attributed to changes in the location and structure of healthcare delivery for many healthcare institutions. Healthcare providers are reassessing how they deliver care, how physicians interact with patients and how best to procure supplies [15]. Nonetheless, the reasons for this theme are unknown and warrant further investigation.



**Fig. 2.** Thematic map of codes and themes relating to research objective 2

**6.2.2.2. Changes in spending.** [23] suggests the corporations' cash flows have been severely hit due to the COVID-19 pandemic. The effect for organizations is different for some it is temporary for others it is longer term, which may lead to financial distress. The interview data also showed that COVID affected company X strategy by changing cost and spending dynamics. Some participants reported that company X made cost savings in specific areas such as travel and utilities. However, other participants noted company X also incurred extra costs in other areas such as information technology infrastructure and hardware.

Participant 1: *«I think there was a lot of cost saving because company X is a travelling company. So if you look at the balance sheet, I think they did a lot of savings».*

Participant 4: *«We spend less money on travel, less money on office space. Of course, we spend more money on devices and all of those things. But I think this strategy on how we do business has impacted us positively».*

Similar dynamics have been reported in other industries and the primary theme was that while workers were home. [24] noted that the costs of running brick-and-mortar branches in the financial industry change. The author described increased investment in digital transformation.

**6.2.2.3. Digitalization.** COVID-19 has given rise to and highlighted the importance of digitalization [25]. COVID-19 pushed BD into employing more digitisation in its strategy, according to participants. According to the data, digitisation also drove other factors such as hybrid and online working. [26] posit that *«COVID has meaningfully fast-tracked digitalization across diverse sectors and has helped reduce the spread of COVID-19 by eliminating the need to be a physical space»*. The authors also highlight that online work and digitally organized logistics have alleviated the undesirable influences of COVID-19. Participant 2 summarizes the sub-theme of digitalization succinctly and how it came about because of the change in the environment. Other participants had similar contributions and many further related the aspect of digitalization to hybrid working.

Participant 2: *«You look at the 2025 strategy of growth, simplify and adjust and under simplify you looked into the push towards digitalization. And you realize that that aspect of digitalization only came after observation of the change in the environment».*

Participant 8: *«It's the innovation, it's being able to move into that digital space, which we are doing. But I think that's been like one of the better impacts. I think the digitization aspect, (...). And I would say the hybrid working as well, definitely the hybrid Working».*

**6.2.2.4. Customers.** Similar to the first research objective to find the COVID-19 impacts on achieving and objectives by employees. The theme of customers was raised again with similar codes to that previous theme-namely, engagement and access to customers. However, COVID-19 impacts on firm performance included reputation, which indicates a slightly different dynamic between achieving goals and objectives and firm performance. The sentiment with regards to customers and firm performance was primarily negative. As seen with the examples below.

Participant 7: *«Restrictions for us to see our customers, you know, a lot of restrictions by the borders when we import and export. So yeah, it has been it is it's a negative».*

Participant 3: *«From a perspective of engagement with customers, I think, for me, it's always about out of sight out of mind. And I think we tried to get back there and back into the field, there's been a lot of change as well».*

According to the interview data, the inability to see customers face-to-face significantly impacts firm performance, and it has mostly been negative. Within modern business sceneries, customer engagement is suggested to generate improved firm performance, including sales growth, superior competitive advantage and profitability [24]. [24] suggests that engaged consumers may produce product or brand referrals, co-create experience and value, and contribute to organizational innovation and consumer loyalty. [18] stated, *«Increasing evidence shows that continuously interacting with medical device users results in the production of most successful and long-lasting medical devices. Conversely, ignoring user views may lead to the medical failing to meet user needs and thus can result in underuse or even rejection»*. This underscores the importance of customers to the overall performance of the organization. COVID-19 significantly impacted firm performance in this regard. As one participant stated, *«out of sight, out of mind»*. Regarding medical device evidence show that this may be literal.

**6.2.3. Prioritization of COVID-19.** Another central theme in the data was how the COVID-19 pandemic caused many aspects of healthcare and business to prioritize COVID-19 (Fig. 3).

The data showed the prioritization of COVID-19 funding and testing affect firm performance. Furthermore, the sentiment regarding how prioritization affected company X firm performance was good. As seen in the examples below.

Participant 3: *«I think during the pandemic, because a lot of funding was given to the COVID projects. Company X did well. (...) The positive impacts were like sales that you never expected. Because now suddenly, everybody wanted me needles and syringes or they want specific tubes for COVID testing. So those kinds of things were unexpected and positive».*

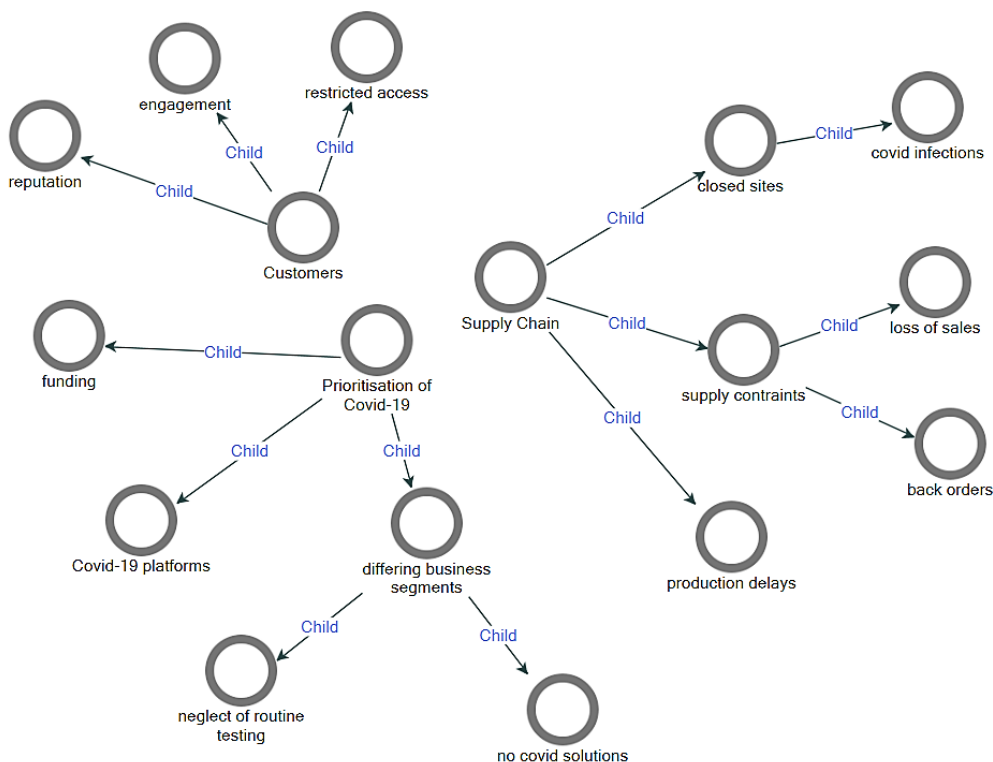
Participant 6: *«...the molecular systems also, did have a good good run in the market as there was a lot of requests for COVID. (...) So I think that was probably the biggest, impact on a positive note».*

**6.2.4. Different financial impacts for different segments.** Of the participants that mentioned financial impacts, a recurring theme amongst the responses was that COVID-19 affects business segments differently. They highlighted that segments able to offer COVID-19 solutions did well financially while another segment performed poorly.

Participant 8: *«Our financial performance, Look, there some business segments that have done well, some that have not? (...) It was really only COVID testing that was running high at that point in time. (...) And at the same time, there was not much or there was quite a dip in the other infectious diseases testing. So that was that impacted negatively for sure».*

Participant 6: *«The COVID kits they had done much better over the period to bring in the capital. But I think that all the other normal relevant tests were put on the back burner. So yes, we were affected from a monetary point of view».*

Participant 1: *«I think they lost money in some segments in some departments like surgery (...) I think they were impacted quite heavily. But then also in the same breath, who would say that they did great when it comes to molecular testing on the company X max, and other platforms that support COVID?».*



**Fig. 3.** Thematic map of codes and themes relating to research objective 3

Other impacts of COVID-19 on firm performance were the prioritization of COVID-19 by company X, external healthcare and non-healthcare providers and funders. The prioritization of COVID-19 was especially good for company X performance because the organization could rapidly develop COVID-19 solutions that could be commercialized. These solutions significantly increased the organization's profitability, market value and growth performance. Another related theme gained from the data was that COVID affected different segments of the organization differently. Business units that are involved with COVID solutions did exceptionally well. In contrast, other units saw revenue decreases as many healthcare institutions like hospitals and labs faced significant ongoing challenges as they tried to deal with deferred essential care and build capacity for new patients. This has contributed to a considerable reduction in technologies employed for routine healthcare procedures and elective care. Many were being set aside so that health institutions could direct reserves on serving COVID-19 patients [9].

**6.2.5. Supply Chain.** The third theme mentioned regarding the impact of COVID-19 on firm performance was constrained supply chain. The constrained supply chain was found to have caused many negative effects, ranging from lost sales to backorders.

Participant 2: «Warehouse had to close and operate at minimum. And so you'd find the whole office being closed. In terms of logistics, that was huge for the guys who were supposed to do picking and shipping off consignments to different countries. You would find the whole warehouse having to close for two weeks».

Participant 5: «We didn't have the stock available to supply (...) So we did see a loss of sales due to the slowdown in the market, but when things started to ramp up we also didn't have stock available. And that also influenced our sales».

Participant 3: «The other challenge we had was obviously a lot of TB (tuberculosis) SKU's (stock keeping units) were on backorder. And that has posed a great impact».

A major theme identified in the interviews was the impact of the pandemic hit global supply chain constraints. A study by [25] demonstrated that the most substantial impacts on end-to-end international supply chain procedures, processes, and governance resulted from supply disruptions, demand volatility, and government COVID-19 responses. Factory closures, border restrictions, travel bans, port closures, and halted shipments suspended the whole supply network, leading to global shortage [26]. The study is consistent with the literature and the global supply chain crisis affects company X. Participants also noted how the pandemic-affected supply chain hinders factors such as sales and customer satisfaction.

Firm performance is determined by how effectively and efficiently the firm's business strategy is organized and executed [15]. The model by [10] utilized in this study utilizes a result-determinants framework that encompasses the idea of the relationship between cause and effect. The cause is the COVID-19 pandemic, and the effect is what this study is investigating. The model consists of nine determinants grouped between financial performance and strategic performance. Based on the data collected, most of the impact of COVID-19 on company X is related to financial performance. In investigating the effect of COVID-19 of firm performance at company X. This study's key findings indicate that COVID-19 strongly influenced financial performance, which influenced firm performance significantly. In addition, financial performance measures were found to have more impacts than non-financial firm performance measures such as strategic performance. When viewing these COVID-19 impacts on firm performance, customer engagement affects customer satisfaction, which is a strategic performance determinant of firm performance, as seen in Fig. 4.



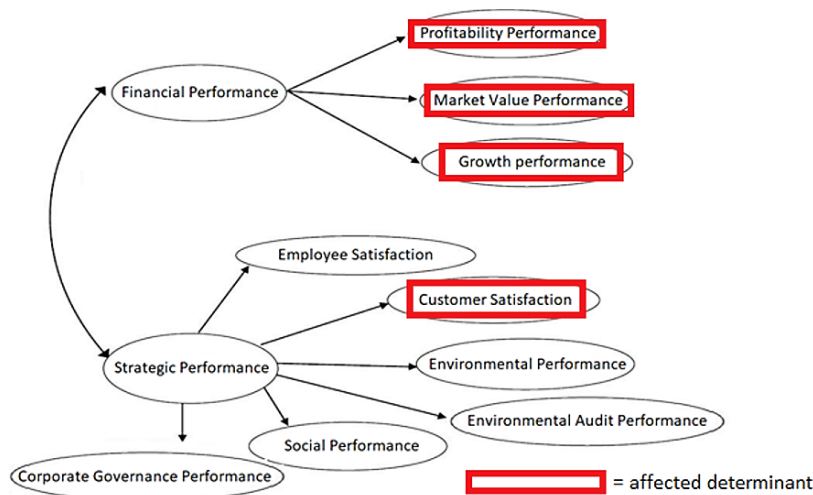


Fig. 4. Result-determinants framework showing affected determinants [26]

**6.2.6. Agility.** When asked for recommendations to address the effects of COVID-19 on company X strategy (Fig. 5).

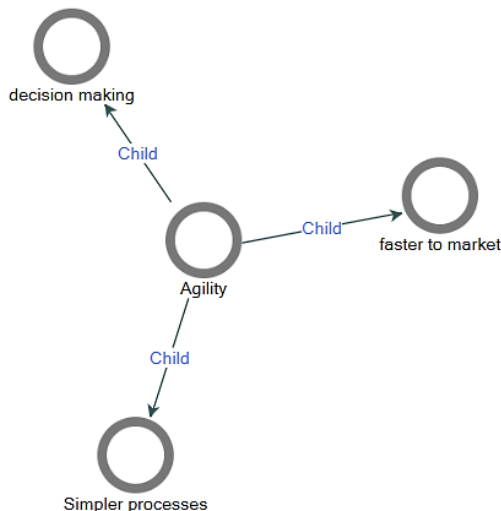


Fig. 5. Thematic map of codes and themes relating to research objective 4

Some participants noted that the company needs to be faster to market, and some participants highlighted implementation and how processes need to be simplified to achieve this. This is consistent with a previously explored theme of adjusting strategy to the changing environment.

Participant 4: «We've never been fast to market. COVID showed us that with veritor they quickly made a turnaround right? We brought solutions to the table. So, we know it's possible. But we tend to take a long-time changing our products or upgrading products just because we want to make sure it's the best quality out there. And so, I think we're a bit slow in producing products that will suit the market».

Participant 6: «There should have been a strategy of how to mass produce the COVID kits and be able to get into the market faster. But it took some time. And I think there were companies that beat us to the market».

Participant 2: «I think for me, it's mostly the implementation part. You find a big organization like a global organization like this one. Once decisions are made, it takes time to implement».

Confoundingly, the recommendations for strategies to address the effects of the COVID-19 Pandemic on deliver-

ing healthcare technology services primarily focused on the concept of speed and agility in the market. [27] states that «Strategic Agility involves business organizations having the capacity to respond swiftly to changing situations». The ability of organizations to anticipate trends and forecast the future to respond appropriately defines the strategic agility of such an organization. [28] posit that it is not the fittest organization but the organizations with high resilience and capacity to adjust that survive. Despite the themes that were determined to negatively impact strategy and firm performance, such as customer engagement and online working, agility and navigating the changing COVID-19 pandemic environment were the priority for participants. Data suggested that agility could be achieved through simplifying processes, streamlining decision-making, and enhancing speed in the market. This may suggest that COVID-19 does not impact the organization's strategy due to its structure. But that may be a topic for further research.

**7. SWOT analysis of research results**

*Strengths.* Company X implemented many initiatives in their strategy to adapt to lockdown restrictions, such as digitization, online work and hybrid working method.

*Weaknesses.* COVID-19 strongly influenced financial performance, which influenced firm performance significantly.

*Opportunities.* This research can assist medical enterprises in other countries to stream its services and align its strategy to meet the dynamic environment caused by the COVID-19.

*Threats.* Other effects of COVID-19 on firm performance are related to the pandemic environment, particularly the lockdown restrictions and their influences on factors such as supply chain, logistics and travel.

**8. Conclusions**

1. This study's key findings on the impact of COVID-19 on firm performance indicate that COVID-19 significantly affects financial performance, which influences firm performance strongly. In addition, financial performance measures were found to have more impacts than non-financial performance measures such as strategic performance. Regarding strategic performance, the findings show that COVID-19 affected firm performance by impeding traditional customer contact and communication methods. The qualitative data indicate that poor customer engagement and relations may reduce sales.

2. COVID-19 changed the medical devices market as there was a considerable reduction in technologies employed for routine healthcare procedures and elective care. Many were set aside so that health institutions could direct reserves on serving COVID-19 patients [9]. [29] posited that the medical device industry is suitable for diversification strategies with multiple-product and small-quantity production. For a firm to grow, it is desirable to improve technological and financial capabilities through related diversification and then switch to unrelated diversification. As a market leader, company X has multiple-product and large quantity production. The organization consists of three segments: Company X Medical,

Company X Life Sciences, and Company X Interventional and employs unrelated diversification. The prioritization of COVID-19 affected company X's firm performance positively; however, COVID-19 affected the different segments of the organization disproportionately. The findings indicated that offering COVID-19 medical solutions within the segment may positively influence firm performance.

3. Other effects of COVID-19 on firm performance are related to the pandemic environment, particularly the lockdown restrictions and their influences on factors such as supply chain, logistics and travel. These factors were identified as also having a significant effect on firm performance. However, they go beyond what an organization can control.

4. The main recommendation identified based on the qualitative analysis was to improve agility and speed. This would be achieved through simplifying processes, streamlining decision-making, and enhancing speed in the market [30], argues that the COVID-19 pandemic has been a catalyst for innovation and emphasized the need for businesses to be agile and strategic. Healthcare providers are reassessing how they deliver care, how physicians interact with patients and how best to buy supplies [6]. Business and healthcare environments are consistently changing despite having already experienced the pandemic's peak. The business environment is still feeling the aftereffects of the peak. However, the pandemic has also opened new opportunities. International businesses are developing innovative ways to build resilience during this time of heightened uncertainty because of the shift in the pandemic's epicentre from region to region [12]. Agility and speed are necessary to overcome or take advantage of new developments from the pandemic and post-pandemic time frame.

Company X implemented many initiatives in their strategy to adapt to lockdown restrictions, such as digitization, online work and hybrid working. However, despite this reorganization, the organization still could not maintain customer relationships effectively; the reasons are unknown, thus warrant further research. Further research can shed light on why digital communication in the healthcare setting is not as effective as direct contact and how to improve the effectiveness of digital engagement with customers.

### Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this article.

### Financing

Presentation of research in the form of publication through financial support in the form of a grant from SUES (Support to Ukrainian Editorial Staff).

### Data availability

Data will be made available on reasonable request.

### Acknowledgments

We would like to thank God for making this article published for free under the SUES grant.

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