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THE EVOLUTION OF DIGITAL TRANSFORMATION IN SMES IN THE MANUFACTURING INDUSTRY IN THE DIFFERENT BLOCKS OF THE BM CANVAS SINCE THE BEGINNING OF THE PANDEMIC

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Abstract. *Purpose* – The following article focuses on assessment of the evolution of digital transformation in SMEs in the manufacturing industry since the beginning of the pandemic. The digital transformation is assessed in the different blocks of the BM Canvas. The main objective of the paper is to evaluate the impact of the pandemic on the development of digital transformation, and to assess whether it is still influencing it now, or vice versa, or no longer has such an impact.

Research methodology – The digital transformation is examined in each block of the Business Model Canvas (BM Canvas) from the beginning of the pandemic to the current state. The individual data is obtained from a survey conducted among 18 SMEs. Small and medium-sized enterprises in the manufacturing industry are examined. The survey is based on semi-structured interviews with SME´s management representatives. The collected data is then processed by examining the average rate of digital transformation in each block, the modus, and the median. The focus was again on developments and changes in the digital transformation of enterprises. The data was collected for three periods – before the pandemic (2019), during the pandemic (2021) and now (July 2022).

Findings – The paper shows the evolution of digital transformation in the different building blocks of the BM Canvas for SMEs in the manufacturing industry since the beginning of the pandemic. The evolution of digital transformation varies across the BM Canvas blocks. For the Channels block, as of July 2022, there has been a decrease in the average digital transformation rate. The other blocks have seen an increase and continue to develop. However, the increases are no longer as high as in 2021. Whether digital transformation will continue to develop for individual blocks in future periods is a suitable research question for further research. The findings show that the changes and developments vary from building block to building block. It was found that the importance of each building block changed during the pandemic for each firm representative. The results provide the basis for the analysis of the development and change of BM Canvas for individual companies.

Research limitations – At the moment, the current situation in Ukraine, in addition to the COVID-19 pandemic, is playing a major role in SMEs activities as it affects companies. This conflict was not considered in the research, and the development since the beginning of the pandemic was followed.

Practical implications – This research highlights how the digital transformation of individual SMEs in the manufacturing industry is evolving. It highlights the impact of the pandemic, which has undoubtedly increased the growth of digital transformation rates. For future research, these results can be very useful, as other influences on the rates of digital transformation can be investigated.

Originality/Value – The research was carried out on the basis of primary data collected by the authors themselves. The data were processed and evaluated. The results of the research show how the level of digital transformation in different blocks of the BM Canvas has evolved from the beginning for each SME in the manufacturing industry.

Keywords: digitalization, COVID-19, digital transformation, Business Model Canvas, SMEs.

JEL Classification: L1, L21, M1.

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Introduction

The COVID pandemic has affected not only physical and mental health of people but also the financial health of companies around the world. Pandemic caused increased digital transformation, changes in customer behavior, and a gap in managerial and technological knowledge to address those (Klein & Todesco, 2021). SMEs are adapting their business models to adapt to this changing environment (Gregurec et al., 2021). Currently, digital transformation in SMEs is an increasingly discussed and hot topic for scholars and practitioners (Cha et al., 2015; Li et al., 2018). The use of state-of-the-art technology to manage business activities during community closure to spread the COVID-19 pandemic, albeit involuntarily, is evidence that technology offers not only competitive advantages but also the means to survive by improvising on existing business models (Akpan et al., 2021).

The aim of this paper is to analyze the evolution of digital transformation since the beginning of the pandemic in the different building blocks of the BM Canvas in SMEs in the manufacturing industry. Furthermore, the variation in the different building blocks within the digital transformation will also be assessed. The conceptual framework used for this research is the Business Model Canvas according to Osterwalder and Pigneuer (2010). This research will contribute to gaining new insights and understanding in the development of the digital transformation rate for each building block of the BM Canvas.

1. Key literature reviews

Digital transformation is an increasingly important topic for companies. SMEs in particular are looking to engage in a comprehensive global digital strategy process (Dethine et al., 2020). The world of digital technology brings opportunities to optimize various challenges, such as just the operation of SMEs in times of pandemic (Viswanathan & Telukdarie, 2021). By adopting digital technology platforms, SME entrepreneurs can establish direct connections between suppliers and customers, and furtherly, they can work closely with other stakeholders (Chatterjee et al., 2022).

The very concept of Business Model (BM) was first discovered in a research paper by Bellmann et al. in 1957. The topic of Business Model has subsequently been the subject of many studies and academic papers conducted by various authors (Osterwalder et al., 2005; Teece, 2010). Some of the influential publications include the works of Linder and Cantrell (2000), Osterwalder (2004), Chesbrough (2006) and many others. Business model research according to Foss and Saebi (2017) has grown significantly, reaching 7391 publications in the Scopus database over the period 1980–2015. The very idea of a business model deals with general, fundamental and familiar problems of a strategic nature (Sandberg, 2002; Verstraete & Jouison-Lafitte, 2011), yet there is still debate about what business models are and their usefulness. The concept of business model was first important for understanding e-business and the commercialization of technology and innovation (Amit & Zott, 2001; Chesbrough & Rosenbloom, 2002; Johnson, 2010; Zott et al., 2011). However, Porter (2001) described the ambiguous nature of business model as "inviting faulty thinking and deception" after analyzing unhealthy business practices on the Internet. According to Osterwalder and

Pignerur (2010), a BM can be defined as an abstract illustration of how an organization works to achieve its strategic goals, while defining 9 main components, called building blocks, for designing a Business Model.

Business models that operate in the digital age are transforming existing industries at a rapid pace (Yrjölä et al., 2020). Digital transformation requires companies to rethink and innovate their business models. However, the problem is that SMEs have little time to experiment with their BMs and implement new strategies (Parida et al., 2019; Bouwman et al., 2019). The pace of change in digital transformation accelerated significantly during the COVID-19 pandemic (Mostaghel et al., 2022). Businesses are trying to cope with the impact of the pandemic by continuing to transform their business models with the support of digital technologies (Priyono et al., 2020).

Digital transformation is described as a comprehensive approach that involves enterprise-wide changes that require the development of new Business Models (Verhoef et al., 2021). Due to the pandemic, the digital transformation of organizations is progressing at a very fast pace. While some companies have gained pioneering roles in digital transformation, other companies are lagging behind because they find the transition very difficult (Abbu et al., 2022). Digital transformation itself is more about people than digital technologies. Organizational changes are required, supported by leadership and driven by radical challenges to corporate culture. For digital transformation, business leaders are required to build trust (Gudergan et al., 2019; Abbu et al., 2020; Mugge et al., 2020).

2. Methodology and research design

The aim of this paper is to explore the evolution of the digital transformation of SMEs in the manufacturing industry in the different building blocks of BM Canvas. The status before the start of the pandemic (2019), during the pandemic (2021) and now (July 2022) is monitored. This research builds on research conducted in 2021, which examined the effect of digital transformation on the BM Canvas of SMEs in the manufacturing industry. Results show that the evolution of digital transformation varies from block to block but has an increasing trend. Therefore, the authors investigate whether the upward trend continues. The analysis is based on research conducted on eighteen selected SMEs in the manufacturing industry. This research is followed by semi-structured interviews with management representatives of each firm. Semi-structured interviews were conducted with management representatives of eighteen SMEs in the manufacturing industry. First, they were asked for a percentage assessment of the degree of digital transformation of the entire company, then they evaluated individual blocks. Afterwards, a discussion was held in which areas digital transformation had shown the most impact.

The focus is on the analysis of developments and changes of digital transformation in the pandemic era, more specifically on how the different building blocks respond to digital transformation and whether they respond proportionally across building blocks or whether the level of digital transformation is rather different. The average level of digital transformation in each building block, the modus and median, and increase since the start of the pandemic is tracked. The survey itself involved management representatives from eighteen selected

SMEs in the manufacturing industry. The level of digital transformation was assessed by the management representatives of the selected companies themselves. Each representative determined the percentage of digital transformation of his company and then determined the percentage of digital transformation in each block of the BM Canvas. The authors then aggregated the data, averaged it, and determined the modus and median. They also calculated the differences between periods. The results of the survey provide a baseline that analyses the evolution and changes of the BM Canvas for these enterprises in the area of digital transformation. The authors examine the evolution of digital transformation in each building block since the beginning of the pandemic.

3. Research findings/results

This chapter presents the results of the research, which focuses on the evolution of digital transformation since the beginning of the COVID-19 pandemic in the different blocks of the BM Canvas in SMEs from the manufacturing industry. Each BM Canvas building block is examined separately with respect to digital transformation. The individual level of digital transformation is assessed in three periods – the period before the pandemic (2019), the period during the pandemic (2021) and the current state (July 2022). The mean, modus and median are used as comparative variables. The results show an overview of the changes in the different building blocks of the BM Canvas for SMEs.

3.1. Customer segment

The customer segment has continued to see growth in the rate of digital transformation since the pandemic began. This was reported by 61.1% of SMEs. 38.9% of SMEs say that they are no longer digitizing this area, or that digital transformation is stagnating. Prior to the 2019 pandemic, the average digital transformation rate was 31.7%. During the 2021 pandemic, this rate was 56.61%, while at the same time companies report an average digital transformation rate of 67.56%. This is therefore an increase over the pandemic period of 35.86% overall. The modus currently has a value of 90%; before the pandemic it had values of 30%, 50% and 60%; in 2021 it was at 60% and 80%. The median is now 71%, an increase of 41% since the start of the pandemic. Table 1 below provides a summary of selected indicators within the digital customer segment.

Table 1. Summarizes the mode, median and average digital transformation rates in the Customer segment block (source: created by authors, 2022)

	2019 (before pandemic)	2021 (during pandemic)	The increase (2021-2019)	Now (2022)	The increase (2022-2021)	Total increase (2019-2022)
Mode	30%, 50%, 60%	60%, 80%	X	**90%**	**X**	**X**
Median	30%	60%	30%	**71%**	**11%**	**41%**
The average rate of digital transformation	31.7%	56.61%	24.91%	**67.56%**	**10.95%**	**35.86%**

The development and completion of an online customer database was noted as the most frequent impact of digital transformation within this block. During the pandemic, these databases were emerging; now companies have established them. These systems help manufacturing companies keep track of their customers and also help them communicate better with them. Companies also report that they have linked these systems to their online communications and their e-stores.

3.2. Value proposition

The Value Proposition block also showed an increase in the level of digital transformation. Here, 61.1% of companies said that the rate of digital transformation has changed. 38.9% of companies said that there has been no or minimal change in the rate of digital transformation. The average digital transformation rate is now 63.28%, an increase of 15.89% since the beginning of the pandemic (2019). In 2021, the average digital transformation rate was at 53.89%, an increase of 9.39%. The modus is now at 80%, and in 2021 there were two values – 50% and 60%; before the 2019 pandemic, the modus was at 40%. The median has also seen an increase, up 20% overall since the start of the pandemic. Before the pandemic, the value was 44%, in 2021 it was 55% and now it is at 64%. Table 2 provides a summary of selected indicators within the Digital Value proposition.

Table 2. Summarizes the mode, median and average digital transformation rates in the Value proposition block (source: created by authors, 2022)

	2019 (before pandemic)	2021 (during pandemic)	The increase (2021-2019)	Now (2022)	The increase (2022-2021)	Total increase (2019-2022)
Mode	40%	50%, 60%	X	**80%**	**X**	**X**
Median	44%	55%	11%	**64%**	**9%**	**20%**
The average rate of digital transformation	47.39%	53.89%	6.5%	**63.28%**	**9.39%**	**15.89%**

The value proposition has adapted to today's times. Companies cite a change in pricing and tailoring of products to customers as a major change. Online product catalogues have also been created for customers to browse. Some companies claim that digital transformation in this block is not yet at the level they would like to see. Further developments in the level of digital transformation of the Value Proposition can therefore be expected.

3.3. Channels

The channels have recorded very interesting numbers. This block has been changed for 72.2% of MSPs in the last year, with 27.8% of MSPs saying they have not been digitally changed. The digital transformation rate for the Channels block has risen to 66.61% since 2019, the start of the pandemic. This is a total increase of 29.78%. What is interesting, however, is that if we look at the period 2021–2022, the digital transformation rate here has seen a decline, by 5.11%. In 2021, the digital transformation rate was at 71.72%, which was an increase of 34.89% from 2019

(before the pandemic started). Companies explain the current decline in the digital transformation rate by saying that they have returned to in-person sales after loosening restrictions. The median also saw a decline, dropping 7% from 2021, to 68%. Before the pandemic it was 40%, yet since the pandemic began the overall figure is positive at 28%. The modus is now at 65%, which also points to declining ratio values. Table 3 provides a summary of selected indicators.

Table 3. Summarizes the mode, median and average digital transformation rates in the Channels block (source: created by authors, 2022)

	2019 (before pandemic)	2021 (during pandemic)	The increase (2021-2019)	Now (2022)	The increase (2022-2021)	Total increase (2019-2022)
Mode	15%	75%, 80%, 90%	X	**65%**	**X**	**X**
Median	40%	75%	35%	**68%**	**–7%**	**28%**
The average rate of digital transformation	36.83%	71.72%	34.89%	**66.61%**	**–5.11%**	**29.78%**

It is easy to explain why Channels' digital adoption rate has declined over the past year. The main reason is that, thanks to the loosening of measures concerning pandemic, they are returning to face-to-face contact. This applies to personal contacts with both suppliers and customers. Within the ordering systems that have been set up, customers have a choice of distribution channels and many of them are using face-to-face purchasing. Thus, companies have responded to the limitations of some distribution channels because they were unused.

3.4. Customer relationships

77.8% of companies say they have been affected by digital transformation in the last year, while 22.2% say they have not. The Customer Relationships block now has a digital transformation rate for SMEs of 79.44%, an increase of 37.5% since the start of the pandemic. Since 2021, this has increased by 15.2%. The modus is now at the same level it was in 2021 – 90%. Before the pandemic, the modus was at 60%. The median has increased by 35% since the start of the pandemic to 80%. Before the pandemic, it was at 45%. Table 4 presents an overview of selected summary indicators.

Table 4. Summarizes the mode, median and average digital transformation rates in the Customer relationships block (source: created by authors, 2022)

	2019 (before pandemic)	2021 (during pandemic)	The increase (2021-2019)	Now (2022)	The increase (2022-2021)	Total increase (2019-2022)
Mode	60%	90%	X	**90%**	**X**	**X**
Median	45%	70%	25%	**80%**	**10%**	**35%**
The average rate of digital transformation	41.94%	64.24%	22.3%	**79.44%**	**15.2%**	37.5%

Manufacturing SMEs say that over the past year, their customer relationships have developed very rapidly in the online environment. Companies are using more online communication tools – social networks, websites, e-shops, etc. While face-to-face customer relationships are still very important, the online environment is becoming increasingly important in communicating and maintaining customer relationships. Moreover, thanks to well-targeted social media posts, they can also attract new customers.

3.5. Revenue streams

According to 61.1% of SMEs, revenue streams have not been affected or have been affected minimally by digital transformation. Revenue streams now have an average digital transformation rate for SMEs of 66.78%. This block has therefore seen an increase of 21.67% since the beginning of the pandemic. In 2021, the digital transformation rate was 61.17%, and for 2022 it has only increased by 5.61%. The modus is identical for 2021 and 2022 – 75%. In 2019 (before the pandemic) it was at 50%. The median has seen a 26.5% increase since the start of the pandemic. Before the pandemic, the median was 48.5%, in 2021 it was 60% and now it is 75%. Table 5 below provides a summary of selected indicators within the Revenue streams block.

Table 5. Summarizes the mode, median and average digital transformation rates in the Revenue streams block (source: created by authors, 2022)

	2019 (before pandemic)	2021 (during pandemic)	The increase (2021-2019)	Now (2022)	The increase (2022-2021)	Total increase (2019-2022)
Mode	50%	75%	X	**75%**	**X**	**X**
Median	48.5%	60%	11.5%	**75%**	**15%**	**26.5%**
The average rate of digital transformation	45.11%	61.17%	16.06%	**66.78%**	**5.61%**	**21.67%**

The main change over the last year has been the establishment of online payment platforms. Newly created e-shops have also started to become one of the main sources of revenue for companies. The original pilot e-shop schemes have evolved into fully functioning e-shops. Here, companies report that they continue to want to expand their online platforms to make this area as digital as possible.

3.6. Key resources

Key resources have not been much affected by digital transformation in the last year, as confirmed by 77.8% of companies. Only 22.2% say that digital transformation has made progress here. Even so, the average level of digital transformation has increased. It now stands at 62.11%, an overall increase of 18.61%. However, over the last year, the digital transformation rate has only seen an increase of 4.33%. The modus currently stands at 60%. Before the pandemic, it was at 30%. During the pandemic (2021), the modus had two values of 60% and 80%. The median value is interesting. Before the pandemic it was 40%. During the 2021 pandemic it was at 60%. This is the median value now. Table 6 shows a summary of the selected indicators for the digital transformation area in this block.

Table 6. Summarizes the mode, median and average digital transformation rates in the Key resources block (source: created by authors, 2022)

	2019 (before pandemic)	2021 (during pandemic)	The increase (2021-2019)	Now (2022)	The increase (2022-2021)	Total increase (2019-2022)
Mode	30%	60%, 80%	X	**60%**	**X**	**X**
Median	40%	60%	20%	**60%**	**0%**	**20%**
The average rate of digital transformation	43.5%	57.78%	14.28%	**62.11%**	**4.33%**	**18.61%**

The companies do not report significant impacts. Most often they mention that they imagine e-commerce as a key source in the future. They also say that they are also creating online systems for employees to better plan shifts to production. However, even so, this area is rather stagnant in terms of digital transformation.

3.7. Key activities

According to 66.7% of SMEs, the level of digital transformation has been affected in the last year, while 33.3% of businesses have not been affected. Key SME activities now have an average digital transformation rate of 79.61%. Prior to the pandemic (2019), this was at 43.78%. In 2021, this rate has risen to 75.39%, up 31.61%. So, between 2021 and 2022, this rate increased by 4.22%. The modus is now at 90%. Before the pandemic it was 40%, in 2021 during the pandemic it was 80%. The median then increased by 45% overall since the start of the pandemic. It is now at 85%, was at 40% before the pandemic, and was at 80% in 2021. Thus, between the period 2021–2022, it has seen a 5% increase. Selected ratios for the selected period are shown in Table 7 below.

Table 7. Summarizes the mode, median and average digital transformation rates in the Key activities block (source: created by authors, 2022)

	2019 (before pandemic)	2021 (during pandemic)	The increase (2021-2019)	Now (2022)	The increase (2022-2021)	Total increase (2019-2022)
Mode	40%	80%	X	**90%**	**X**	**X**
Median	40%	80%	40%	**85%**	**5%**	**45%**
The average rate of digital transformation	43.78%	75.39%	31.61%	**79.61%**	**4.22%**	**35.83%**

The level of digital transformation in this block was also influenced by the creation of new e-shops. E-shops are becoming the main key activities that bring companies more and more profit. As a result, some companies have been able to transfer their activities from the pure B2B market to B2C markets. Some companies have also developed production automation as part of their core activities. Companies have invested in new production machinery and IT technologies. This change has resulted in more efficient employees who can process more products thanks to better production processes.

3.8. Key partnerships

50% of companies were affected by this block. Key partnerships have seen a 22.05% increase in the average digital transformation rate since the pandemic began. It now stands at 60.44%. Before the pandemic, this value was at 38.39%. In 2021, it has increased by 15.11%, to a level of 53.5%. The modus currently has two values – 50% and 75%. In 2019, the modus had three values - 20%, 50% and 60%. In 2021, the modus had only one value – 50%. The median within this block increased by 28.5% to a level of 62%. Before the pandemic, it had a value of 33.5%, and by 2021 it had seen a 19% increase to a value of 52.5%. Summary selected ratios are shown in Table 8 below.

Table 8. Summarizes the mode, median and average digital transformation rates in the Key partnerships block (source: created by authors, 2022)

	2019 (before pandemic)	2021 (during pandemic)	The increase (2021-2019)	Now (2022)	The increase (2022-2021)	Total increase (2019-2022)
Mode	20%, 50%, 60%	50%	X	**50%, 75%**	**X**	**X**
Median	33.5%	52.5%	19%	**62%**	**9.5%**	**28.5%**
The average rate of digital transformation	38.39%	53.5%	15.11%	**60.44%**	**6.94%**	**22.05%**

The main change in business partnerships is the cooperation with PR agencies, which take care of the company's online communication. Some companies have also created inventory delivery systems to make material purchases as efficient as possible. This is what the external IT companies that have created these systems help them with.

3.9. Cost structure

The cost structure of digital transformation has been on a slight upward trend over the last period. According to 77.8% of SMEs, this block continues to be digitally transformed. 22.2% of SMEs say that it is not. Since the beginning of the pandemic, the average digital transformation rate has seen an increase of 8.33% to 68.5%. At the beginning of the pandemic, the digital transformation level of this block was at 40.56%, and by 2021 it has increased by 19.61% to a value of 60.17%. Thus, the overall increase since the beginning of the pandemic is 27.94%. The modus before the pandemic was 40%, by 2021 it was at 80%, and currently it has two values – 75% and 85%. The median has then increased 31% overall since the start of the pandemic. Before the pandemic it was at 42.5%, in 2021 it had a value of 60% and now it has a value of 73.5%. Table 9 shows a summary of selected ratios.

Companies report that the introduction of new machines and systems has resulted in significantly lower product costs. Costs have been passed on to the external companies that manage the systems for them. However, even so, digital transformation has reduced costs for most companies. Their investment in production automation is paying off and most expect a very quick return.

Table 9. Summarizes the mode, median and average digital transformation rates in the Cost structure block (source: created by authors, 2022)

	2019 (before pandemic)	2021 (during pandemic)	The increase (2021-2019)	Now (2022)	The increase (2022-2021)	Total increase (2019-2022)
Mode	40%	80%	X	**75%, 85%**	**X**	**X**
Median	42.5%	60%	17.5%	**73.5%**	**13.5%**	**31%**
The average rate of digital transformation	40.56%	60.17%	19.61%	**68.5%**	**8.33%**	27.94%

3.10. Importance of individual building blocks for manufacturing SMEs

At the end of the research, we asked businesses if they could now rate each building block according to its importance to their company. The ratings were made on a scale of 1–5, with the number 1 indicating the least significance and the number 5 representing the greatest significance. These values were compared to the previous values that were obtained in 2021. It is very interesting to see how some of the blocks are now more significant to companies than before. Table 10 below shows the average significance values for each building block.

Table 10. Average significance values of individual building blocks (source: created by authors, 2022)

	The Average Significance (2021)	The Average Significance (2022)	The Difference
Customer segments	4.30	4.72	+0.42
Value propositions	3.00	3.05	+0.05
Channels	2.78	2.33	–0.45
Customer relationships	4.06	4.44	+0.38
Revenue streams	3.33	3.67	+0.34
Key resources	3.06	3.22	+0.16
Key activities	3.28	3.67	+0.39
Key partnerships	3.28	3.67	+0.39
Cost Structure	3.44	3.83	+0.39
The Total Average	3.39	3.62	0.23

Table 10 shows that the significance for each building block has changed over the last year. The Customer segment continues to be the most significant for companies, with a significance level of 4.72, an increase of 0.42. This explains that customers are very important to a business in generating profits and without segmentation they would not be able to function properly. On the other hand, the Channels block continues to have the lowest significance. It even recorded a decrease of 0.45. During the pandemic distribution channels were very important due to the constraints due to the pandemic. Now, as the measures have eased, companies are returning to face-to-face contacts, negotiations, and hence Channels have lost

some of their relevance to businesses. But apart from Channels, all building blocks have seen an increase. What is interesting is the prominence for Key Activities and Key Partnerships. In 2021 they had the same values of 3.28. Even now they have the same values of 3.67, an increase of 0.39.

3.11. Summary of results

SMEs have an average digital transformation rate of 68.3%. This is an overall increase of 27.3% since the beginning of the pandemic (2019). In 2021, the average digital transformation rate was 61.6%, an increase of 6.7% over the last year. Even though businesses are going digital, the upward trend has already dropped significantly. Figure 1 below shows the average digital transformation rate of SMEs in the manufacturing industry.

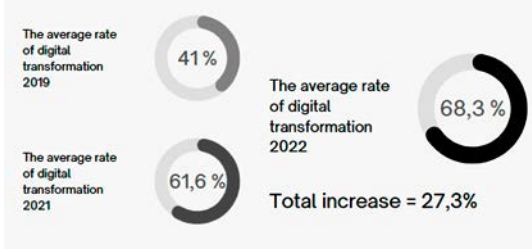

Figure 1. The average digital transformation rate of SMEs in the manufacturing industry (source: created by authors, 2022)

In the following Figure 2, we can see the average digital transformation rate of each building block of BM Canvas for 2019, 2021 and 2022. Now, the Key Activities block is the most digitized at 79.61%. Customer Relations also has a high digital transformation rate of 79.44%. The least digitized block is then Key Business Partners, which is at 60.44%.

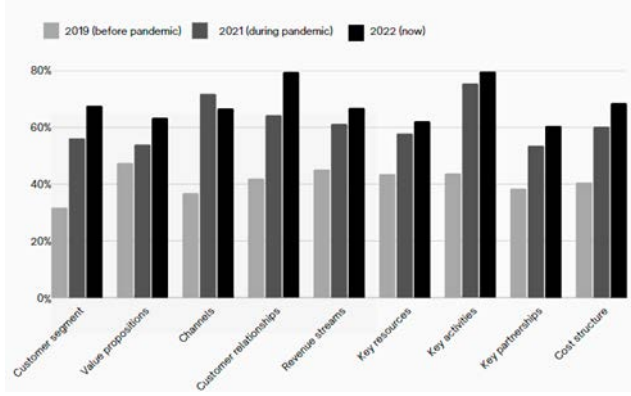

Figure 2. The average digital transformation rate of each building block of BM Canvas for 2019, 2021 and 2022 (source: created by authors, 2022)

3. Discussion

The authors Christofi et al. (2023) looked at new digital technologies in SMEs in combination with the challenges faced by the pandemic. The authors argue that the pandemic has forced enterprises to innovate their business models. This can be confirmed by our research, where we have shown a significant change in digital transformation in SMEs for the Canvas business model since the beginning of the pandemic. The authors of Christofi et al. (2023) also argue that these changes have a positive effect on the persistence of enterprises to innovate business models. Malodia et al. (2023) also find a significant association between digital transformation and firm performance. According to Rupeika-Apoga et al. (2022), digital transformation has a positive mediating effect due to digital orientation on revenue and business model as well as a digital capability on revenue.

Based on our research and that of other authors, it can be concluded that digital transformation has been accelerated by the pandemic. Digital transformation also has a positive effect on the better performance of SMEs. These findings can be useful for SME managers and practitioners. If SMEs stay with digital technology, they can benefit from it. Our research has also focused on the evolution of digital transformation rates at BM Canvas since the beginning of the pandemic. A surprising finding is that some blocks have digitally transformed very quickly due to the pandemic. For example, the "channels" block. However, in 2022, when the pandemic measures were not so strict, this block saw a decrease in the digital transformation rate. This is because companies were returning to face-to-face communication. Even so, most of the blocks continue to digital transformation and it will be interesting to see the evolution in future research.

Conclusions

The authors observed the evolution of digital transformation changes in small and medium-sized manufacturing companies since the beginning of the pandemic. Based on a survey and semi-structured interviews with SME's management representatives, significant changes in several aspects of BM models were highlighted. Prior to the pandemic, the average digital transformation rate for each BM Canvas building block at companies was around 41%. The highest rate was for Value proposition at 47.39%. Conversely, the lowest was at 31.7% for the Customer segment. After the pandemic outbreak, all the building blocks saw an increase in the average digital transformation rate. However, the increase was not high everywhere. Some building blocks were less impacted by the COVID-19 pandemic because companies did not feel the need to apply digital tools. In 2021, the overall average digital transformation rate rose to 61.6%. Channels saw the highest increase in average digital transformation rate at 34.89%. However, in 2022, the rate of average digital transformation rate slowed down, it had a value of 68.3%. Even though most building blocks saw an increase, it was not as significant as in 2021. The Channels block even saw a 5.11% decrease in the average digital transformation rate, to a value of 66.61%. The companies explained this by saying that there was no longer a need to use some Channels once some measures were relaxed. Companies also saw a change in the importance of individual building blocks during the pandemic. On a scale of 1–5, where number 1 indicated the least significant and conversely number 5 the

most significant, companies began to place more importance on the Customer segment, which has now risen to a value of 4.72. An equally important block for companies is the Customer relationships block with a value of 4.44. This indicates that companies have begun to recognize the value of the customer even more as shopping has been curtailed by measures through the pandemic. In terms of significance, Channels has now decreased in value and is therefore the least significant block according to companies.

In conclusion, the evolution of digital transformation varies across building blocks of the BM Canvas. For the Channels block, as of July 2022, there has been a decrease in the average digital transformation rate. The other blocks have seen an increase and continue to develop. However, the increases are no longer as high as in 2021. Whether digital transformation will continue to develop for individual blocks in future periods is a suitable research question for further research.

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