Context based impact analysis of the factors influencing digital tranformation in SME's

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Abstract: Most of the businesses, particularly Small to medium enterprises (SME's) are unable to completely benefit from the absolute potential of digitalization. Researchers have identified the lack of digitalization know-how, misaligned /unrealistic goals, lack of financial resources and lack of plan of implementation as the major constraints behind this failure. Out of the four, three are directly linked with a comprehensive understanding of the process of digital transformation. Similarly, literature has identified several influencing factors that can affect the digitalization process, however, there is no such framework that allows the SME's to clearly identify and assess the influence of these factors on the digitalization journey. For effective reconfiguration of business, a detailed understanding of these factors influencing the digitalization in SME's is extremely important. It is pertinent for SME's to be able to understand this influence in varying digitalization contexts to achieve the intended goals. Therefore, a systematic literature review was carried out to present a context-based impact analysis of factors influencing digital transformation in SME's. The proposed research can help SME's to devise a focused digitalization plan and implementation strategy by addressing the more relevant factors.

Keywords: Small to medium enterprises (SME's), Digital transformation (DT), Digitalization, Work system framework (WSF), Digitalization context, Digital strategy framework (DSF), Dimensions.

1. Introduction

European Commission (2015) explicated the intelligent use of modern communication technologies as one of the key factor for gaining competitive advantage in the European market, especially for the Small to medium enterprises (SME's). They described the positive impact of the use of advanced communication technologies on the organizational productivity and efficiency along with their capability to innovate and fulfil the ever-changing needs of the modern market. This process of adopting digital technologies and integrating them into various aspects of the enterprises to improve efficiency, productivity, and competitiveness is referred to as Digital Transformation (DT)(Brodny and Tutak, 2022). However, Bouwman et al., (2019) explained that most of the businesses, particularly SMEs are unable to completely benefit from the absolute potential of digitalization. This may be due to various constraints such as financial limitations, lack of IT resources and expertise, and inadequate strategy. According to the reports by Little (2019), Peter (2017), and OECD (2021), the major reasons behind this failure include the lack of digitalization know how, misaligned /unrealistic goals, lack of financial resources and lack of plan of implementation. Out of the four, the last three are directly linked with lack of comprehensive understanding of the process of digital transformation.

Further, Ghobakhloo and Ching (2019) recognized that integrating digital technologies into SMEs can come with various challenges. Several internal and external factors can influence the success and effectiveness of technology implementation. For effective reconfiguration of business, a detailed understanding of these factors influencing the digitalization process in SMEs is extremely important. Several authors and experts have identified these factors for different types of SME's (Cresnar et al., 2023; Costa & Castro, 2021; Arifi and Hikkerova, 2021). Most of them have also categorized these factors based upon Technology, Environment and Organization (TOE) framework or grouped them as internal and external factors. This paper intends to provide a different categorizing scheme that constitutes a set of representatives that mimic modules of an organization. Moreover, there is no such framework that allows the SME's to clearly recognize and assess the impact of these factors under different organizational transformation contexts. It is pertinent for SME's to be able to understand these factors in varying transformation contexts as this can help them devise focused digitalization plan and implementation strategies by addressing more relevant factors.

The paper is structured as follows: Section 2 describes the methodology framework of this research, while Section 3 explains the detailed literature review findings of the study. Section 4 presents discussion and section 5 draws the conclusions and delineated future research possibilities.

2. Methodology

To gain comprehensive understanding about the factors and their impact on aspects for DT (different areas of a business that are directly or indirectly influenced by the implementation of digital technologies) under varying context, a two-step approach has been adopted. First step was to conduct a systematic literature review for identification of the existing knowledge about the aspects for DT and factors influencing digital transformation. In the second step, these factors and aspects were inductively categorized, and transformation contexts were defined. Finally, the impact analysis of the identified factors was carried out under varying context to determine their impact on different aspects for DT. The guidelines proposed by

Preferred Reporting Items for Systematic Reviews (PRISMA) were followed (Page et al., 2021). Effective results are highly dependent on accessing the relevant material through efficient querying and use of keywords. Scopus and Google scholar databases were used to search for the relevant study material due to their magnitude and high accessibility. When the retrieved results from both the databases were cross checked there was a high similarity percentage (almost 90%), that lead to choosing the results from Scopus. To identify factors influencing digital transformation in SME's, "digital transformation" was the most relevant keyword as it represents the primary area of research. Further, "factors" and "influencing" were to be added to the queries as the main keywords. Different synonyms reflecting the actions of these words (like variables, dimensions or elements etc that reflect factors) were also added to access as many relevant papers as possible. 763 search items were returned collectively by these queries. The papers published in or after 2016 were selected. This inclusion criteria restricted the search results to updated and recently published 520 research papers. Out of these, 80 papers were shortlisted by the relevance of their titles to the proposed work. As shown in the figure 1, the number of studies were further reduced to 38 papers after reading the summary and the results of these papers.
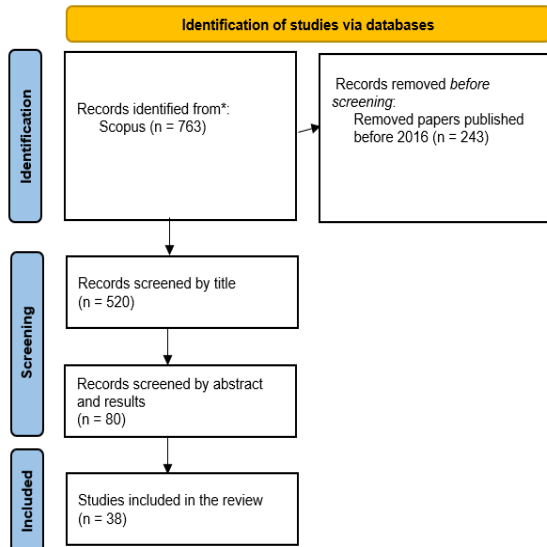

Figure 1: PRISMA Reporting items for the systematic review

Same procedure was carried out for the identification of aspects for digital transformation. 1,088 search results were returned, out of which 93 were filtered based upon the title of the paper. Further reading of abstract and summary reduced this numbers to 24.

3. Literature review findings

SME's constitute a significant portion of the global economy, but they face many challenges in adapting to the digital era. These companies also face increasing pressure to improve operational efficiency, reduce costs, and enhance competitiveness due to market saturation. Davenport et al., (2020) explained that digitalization is a process that allows SMEs enhance their operations, optimize organizational processes and improve overall performance by allowing strategic decision-making. The process of digital transformation involves incorporating digital tools, systems, and processes into existing operations, workflows, and business models (Depaoli and Scornavacca, 2020). Further, Ismail et al. (2017) explicated that the Digital business strategy involves the transformation of a business by incorporating digital technologies and enhancing digital resources across different aspects (also referred as dimensions, areas etc. in research but this paper addressed them as aspects of DT).

3.1 Aspects for DT and influencing factors

Researchers have used different denominations that represent these aspects for DT in the given cases. For instance, a digital strategy framework (DSF) proposed by Adlmaier & Schildhaue (2017) used processes, structures, organization, roles and responsibilities, new technologies, business model, product/services, culture, IT, controlling, customer relationships and customer experience as the aspects of digital transformation. Similarly, other scholars used different names like product innovation, process engineering, transformation management, governance etc. to explain these aspects of transformation. DSF aspects provided in table 1 refer to various denominations used by researchers in different studies (Schallmo and Rusnjak, 2021; Schildhauer et al., 2019; Feichtinger, 2018; Tarute et al., 2018; Nadeem et al., 2018; Bujak & Esser, 2017; Baculard et al., 2017; Leadrer et al., 2017; Peter & Marc, 2017; Matt et al., 2015 and Wade, 2015). These aspects refer to different areas of an organization, which are directly or indirectly effected by application of digital technologies, Therefore, work system framework (WSF) elements (Alter, 2011) were used to scheme these aspects of a business for DT. It proposed nine elements to be part of any description of a work system. This helped providing foundation to comprehensively describe and analyse an IT backed work system of an organization (Alter, 2011).

Furthermore, the internal and external factors influencing DT of SME's identified from literature (Cresnar et al., 2023; Costa & Castro, 2021; Arifi and Hikkerova, 2021; Hassan et al., 2021; Buer et al., 2021; Hoe, 2020; Irimias & Mitev, 2020; Garzoni et al., 2020; Fachrunnisa et al., 2020; Isensee et al., 2020; Chan et al., 2019; Dilber, 2019; Sandukhl et al., 2019; Dincă et al., 2019; Martinez, 2019; Vial, 2019; Ferriara, 2019; Goduscheit & Faullant, 2018; Tarute et al., 2018; Wilaisakoolyong, 2018; Lederer et al, 2017; Chatzoglou & chatzoudes, 2016) were also grouped based upon the work system framework (WSF) elements. Since the aspects for DT were selected based upon WSF, the categorization of these factors based upon the same framework will make it easier to be analyzed. The table 1 below provides the work system framework based categorization of aspects for DT and the influencing factors.

Table 1: WSF based categorization of aspects for DT

Aspects for DT (WSF)	DSF aspects	Factors influencing DT
Business Processes	Processes and operations	Process standardization, Integration capabilities, Performance- monitoring

Participants	People, talent and culture	Skills, Engagement, Training
Data, Technology and Infrastructure	Systems, new technologies and Data analytics	Digital maturity, Tech. accessibility, Tech awareness, Tech. support, Available Tools, Data handling, Use of data System compatibility, Security
	IT capabilities	
Environment	Structures, Organization, operating model and partnership.	Structure, Adaptability, Communication, Culture, Change Management, Agility, HR resources, Financial resources, Budget allocation, Partnerships, Market & Competition, Regulations, Tech changes, Govt policy
Business model & strategies	Strategy and business model, economic model, Digital business development	Strategic Vision, Leadership commitment
Offerings	Product & services	Quality, Novelty , Cost, Acceptance, Value
Customers	Marketing, customer experience, customer behavior, customers & engagement channel	Customer Expectations, Privacy, Security, Marketing opportunities

3.2 Impact dimensions and aspects of DT

Adoption of digital technologies into different aspects or dimensions have made researchers determine different dimensions of impact of DT. For instance, Pousttchi (2019) described that the impact of digital transformation on enterprises is broadly distinguished in three dimensions: i) value creation; ii) value proposition, and iii) customer interaction. Value creation refers to the influence of digital transformation on development of novel products and services involving the refinement of organizational processes, organization and structure of the company and its workforce. Value proposition focuses on direct and indirect influence of DT on the choice of products and services offered to the market and improvement in the offering model. It addresses the effects of the use of digital tools and techniques to improve the existing or offer novel products and services along with the changes that are associated with the revenue model. Finally, customer interaction covers the influence of platform economy dynamics, which includes the type, and content of interaction with the customers (Pousttchi, 2019). Since these dimensions describe the influence of DT on an enterprise, it can be implied that these dimensions are actually the major motivations for the enterprises to undergo DT. Therefore, this study used these impact dimensions as the three DT contexts.

Holopainen et al., (2023) established value creation paths of organizations undergoing DT. It comprises four primary elements: structural factors (organizational capabilities like organizational and employee related factors), use of technology, clear aim of DT and organizational barriers (both internal like misaligned processes etc. and external like collaborations etc.). Similarly, Dost and Manolatos (2023) explained that DT that is concerned with value creation requires the enterprises' to demonstrate an accomplished digital strategy, have the technology aligned to the strategy, and to exhibit digital change capabilities. The value creation can be in form of novel product development or establish new capabilities. Success of a digital strategy is only possible if right technological tools and resources are available to complement the strategy, as misalignment between the technology and strategy may result in failure. Along with that, it is necessary to have culture, environment and resources to adapt changes in processes and activities. It is primarily concerned with the human capabilities and skills of the employees that are essential to adapt digital technologies (Deloitte, 2023). Qiao et al., (2024) also identified data, technology, talent, value, and environment as system boundaries that help realizing value creation of DT. This implied that digital strategy for value creation must be holistic and address all the aspects. However, processes, technology infrastructure, data, participants and environment are the aspects under indirect influence (highlighted green in table 2). Offerings is the primary aspect, which is majorly or directly influenced (highlighted red) whereas the other two (customers and business model & strategy) are less or irrelevant aspects in the context of value creation (highlighted yellow).

On the other hand, the conceptualization of value proposition in digital world is still ill defined and is largely restricted to offering model. It is concerned with the improvement in the offerings, offering model or the selection of the market for offerings (Wessel et al., 2021; Taylor et al., 2020). Pousttchi (2017) explained that the value proposition focuses on the refinement of offerings, development of offerings and development of new revenue models. Therefore, offerings and business strategy are the directly influenced aspects, which are majorly influenced; technology infrastructure & data is the indirectly influenced aspect, whereas environment is somewhat relevant; finally, processes, people and customer aspects and the less or irrelevant aspects in value proposition context. DT for customer interaction is about enabling multichannel customer touchpoints for enhancing user experience.

The DT in context of customer interaction includes devising a customer focused digital strategy (Tafti et al., 2013), investigating customer related data (Shockley et al., 2012), assessing customer engagement and development of interaction channels etc. (Wrigley et al., 2019). Therefore, it is obvious that customers is the directly influenced aspect. Technology infrastructure & data and environment are the indirectly influenced aspects; processes, people and business strategy aspects are the less or irrelevant aspects in context of customer interaction.

Table 2: Matrix of impact dimensions and aspects of DT

Aspect for DT	DT context		
	Value creation	Value Proposition	Customer interaction
Business Process	Indirectly influenced	Less or irrelevant aspect	Less or irrelevant aspect
Participants	Indirectly influenced	Less or irrelevant aspect	Less or irrelevant aspect
Data Technology & infrastructure	Indirectly influenced	Indirectly influenced	Indirectly influenced
Environment	Indirectly influenced	Somewhat relevant aspect	Indirectly influenced
Business Model & strategy	Less or irrelevant aspect	**Primary aspect** (under influence)	Less or irrelevant aspect
Offerings	**Primary aspect** (under direct influence)	**Primary aspect** (under direct influence)	Less or irrelevant aspect
Customers	Less or irrelevant aspect	Less or irrelevant aspect	**Primary aspect** (under direct influence)

3.3 Potential impact of the factors influencing DT

The categorization of the factors influencing DT based on WSF also helped to describe the impact of these factors on the relevant aspects of DT (presented in table 3).

Table 3: Possible impact of DT factors on aspects

Aspects for DT	Impact
Business Process	Efficiency, Automation, Transparency, Traceability, Speed, Interoperability
Participants	Involved decision making, Innovative thinking, Performance monitoring, Skill development
Data, Tech. & infrastructure	Access to relevant & dynamic data, KPI changes, Monitoring, Information gain, In-depth insights, Application of relevant digital tools
Environment	Business model, adjustments, Inter-organizational structure alignment, Well defined Cooperation & interaction points, Easy to communicate, Clear role

	assignment, Flexibility, Reduced dependency, Innovation culture
Business Model & strategy	Flexible business model, Varied offering channels, Agile business strategy, Possibility of rebranding, More opportunities to grow
Offerings	Innovative product or service development, Continuous improvement, Cost reduction, Digital prototypes, Enhanced quality, Personalization, Time reduction
Customers	Enhanced UX, Influenced buying journey & pattern, Perception change, Enhanced customer support, Enhanced customer service, Customer loyalty

4. Discussion

Based on the matrix of impact dimensions and aspects of DT in table 2, a context-based impact analysis of the factors influencing DT is presented below in table 4. It was revealed that not all factors are relevant in each DT context and context-based DT impacts specific aspects rather than affecting the entire work system, limiting the scope of transformation to more relevant aspects. As the proposed framework not only demonstrates the potential impact of factors across DT aspects under different DT contexts but also specifies different contextual goals for DT. It can help organizations to set more realistic goals and KPI's and understand what to expect under the given context. For instance, under the value creation DT context, the goal could be designing or development of innovative offerings. Under this DT context, business processes, participants, data tech & infrastructure and environment aspects are transformed to bring about improvements that eventually lead to achieving the goals. Similarly, under value proposition context, the proposed framework specifies goals like refinement of the offerings, improving the cost and quality of the offerings, development of new revenue models and digitalizing of the offerings etc. Data tech & infrastructure aspect undergo major transformation and environment aspect may also be transformed to achieve the goals under the value proposition context. For customer interaction context, some major goals are to improve customer's buying experience, enhance customer service and adapt innovative ways to market the products to the customers. Data tech & infrastructure and environment aspects undergo major transformation that in response help achieving desired goals.

Table 4: Context based impact analysis of digital transformation in SME's

Aspects for DT	Impact/improvement under varying contexts		
	Value creation	Value proposition	Customer interaction
Business Process	Efficiency of the processes can increase Streamlined and automated workflow Easy integration with other processes Fast, transparent and traceable Processes Standardization of processes meeting legal requirements		

Participants	Employee skills are enhanced thanks to advanced training for employees Employees involvement in decision makin Creative thinking is fostered Employee performance can be easily monitored and tracked		
Data, Tech. & infrastructure	Access to dynamic and relevant customer, market, sales and employee data Data analysis provides in depth insights Application of digital tools: like digital twin enables mimicking physical systems Key performance indicators may change Remote monitoring (people/machines)	Access to dynamic and relevant market data Key performance indicators may change Remote monitoring (people/machines)	Access to dynamic and relevant customer data Application of digital tools: like AR/VR based product catalogue Key performance indicators may change Remote monitoring (customers)
Environment	Innovative ways of employee hiring Cooperation & interaction points among organization units gets defined well Easy, efficient & traceable communication Well defined role assignment & access Degree of flexibility increases Intelligent resource management decreases resource & supplier dependency Innovation culture may be promoted	Cooperation & interaction points among organization units may get defined Communication may become easier, efficient and traceable	Communication between customers and business gets easier, smooth and traceable
Business Model & strategy		Business model adjustment based on data New offering channels may be developed Business strategy could be agile Rebranding of business is possible More opportunities to grow	
Offerings	Designing or development of innovative products/services	Offering customized products Continuous improvement of offerings. Enhancement of offerings quality Digital prototypes to influence customers. Reduction in the cost of offerings Reduction in the development time.	
Customers		.	Changing buying experience Influencing customer's buying journey and patterns Altering customer's perception about the organization Additional customer support Improvement in customer services Influencing Loyalty Innovative and additional ways to market the offerings.

5. Conclusion

Digital transformation can play an immense role in improving organizational productivity and its efficiency along with increasing its capacity to innovate. However, organizations, particularly SME's are still reluctant to under DT. Along with others, lack of knowledge about DT implementation process is a crucial factor behind the digitalization failure, which leads to lack of interest from the SME's towards DT. Further, there are different factors that can influence DT in SME's. Though, these factors have been studied by many authors in general and across specialized sectors like manufacturing, accounting and sales etc. But there is no such study that has yet analysed these factors in specific digitalization contexts. Therefore, this study provided a context specific impact analysis of the factors influencing DT considering different aspects of an organization. WSF was used to define categories for these factors and to scheme the aspects for DT. The three impact dimensions of DT were used to define the digitalization contexts under which the impact of these factors was analysed. It was revealed that not all factors are relevant in each DT context and context-based DT impacts specific aspects rather than affecting the entire work system. The proposed framework demonstrated the potential impact of factors across DT aspects under different DT contexts along with specifying different contextual goals for DT. Thus allowing effective utilization of resources, which is one of the major barriers for SME's.

As a limitation, this work presents its findings based upon the knowledge from literature, and does not include yet any data or direct knowledge from the industry. A multiple-case study analysis from the industry for cross-case conclusions should support the verification and elaboration of these findings,

thus making the conclusions more reliable for the industry to gain better understanding of DT. Further, the knowledge pool was restricted to papers published in 2016 or after to limit the scope to more recent knowledge. A larger knowledge pool may have impacted the results of the study, that too should be investigated.

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