DIGITAL TRANSFORMATION: READINESS OF THE LEBANESE MANUFACTURING INDUSTRY

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Abstract

Purpose – The purpose of the present research is to analyze the barriers affecting the readiness of digital transformation implementation in the manufacturing enterprises in Lebanon.

Design/methodology/approach – The research implemented a mixed approach using survey based questionnaires and interviews in order to understand the barriers that could impact the readiness of manufacturing organizations for digital transformation. The research implemented a deductive approach therefore it relied on previous studies and theories to validate the research hypotheses, and followed the positivism philosophy to validate the hypotheses.

Findings – The significant barriers were categorized in three factors, organizational challenges, cultural and strategic challenges and external challenges. The most challenging barriers to the readiness for the implementation of digital transformation identified through the interviews and the questionnaire are absence of skills, and lack of external capacity building. As to the awareness about digitalization and awareness about its benefits, the main barriers were insufficient knowledge, and lack of international market exposure.

Research limitations/implications -- The qualitative research was limited to the small sample size and the very limited number of previous research conducted in the industry and in the country taking into consideration the data and interviews that had been collected during a financial crisis taking place in Lebanon and during a global pandemic namely the COVID 19.

Practical implications – Other manufacturing companies may learn about the barriers found through this research. They would be able to assess their readiness and consequently work on overcoming the barriers prior to the implementation through the company would be able to work on internal barriers and lobby for the external ones.

Originality/value – The present research is the first is Lebanon concerning the implementation of digital transformation in the manufacturing companies.

Keywords: Industry 4.0, Manufacturing enterprise, digital transformation, implementation, barriers, digitalization.

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Chapter 1 - Introduction

1.1- General background

In 1703, Gottfried Wilhelm Leibniz was the first philosopher that described the binary system and the concept called "digitalization" (Leibniz, 1703). The concept consists of a base 2 numerical system using two symbols 1 or 0 (Leibniz, 1703). The concept was then consecutively improved by Mertens (2014).

Over the years, the development process of digitalization has speeded up. Digitalization provided the opportunity for businesses to change and transform. Digital business transformation is the journey of reinventing how daily business is conducted to fully exploit information technology and to facilitate supply chain collaboration to achieve unprecedented levels of operational excellence (Bowersox, Closs, & Drayer, 2005).

This study emphasizes the upcoming manufacturing technology, it is defined as the communication of the machineries between each other's and the communication between all the elements of the supply chain, which is also called digital manufacturing. This upcoming technology is the fourth industrial revolution, it is referred to as the Internet of Things (Ashton, 1999) or Industry 4.0 (Federal Ministry of Education and Research in Germany, 2011). It carries with it not only lots of challenges but more opportunities to the manufacturing world. Enterprises will have to change their structures, processes and align their work with the suppliers and end users (Hameed, 2018). The present thesis will explore the requirements to do this transformation and integrate its technology into manufacturing.

The present review focuses on the development of the Supply Chain Relationship Management as a remote engine. Many concepts are found in literature with common terms, aside from the word digitalization (Hermann et al., 2016), such as Global Internet (Bonnini, 2014), the Internet of Things, the Distributed Economy (Bauernhansl, 2014), Smart Technologies, Smart Production, and Industry 4.0 (Industry 4.0).

In the German literature in particular the term Industry 4.0 (I4.0) is widespread, slowly reaching Anglo-Saxon literature (Coleman et al., 2017). The expression "industry 4.0" applies to the fourth industrial transition contributing to further growth of the administration of supply chain operation and regulation (Crawley, 2013).

Automation that focuses on cross-linking networks connecting with one another through the Internet is the key feature of the I4.0 (Crawley, 2013). It allows I4.0 to be described as "a

meta concept to improve development further and to build value structures by connecting the physical world with the digital environment" (Deloux et al., 2009). The Dortmund Management Model 4.0 is formalized by Hompel and Henke (2017) offering guidelines for professionals and analysts for turning profit creating practices into Industry 4.0.

The booklets (Flynn,2010) include more detail on I4.0 and its elements. The term digitization is specified for this article, but associated with that, as required action on the path to Industry 4.0. Changes in the business environment are the leading firms in adapting new production model termed agile manufacturing. It is seen as the winning strategy to be adopted by manufacturers bracing themselves for dramatic performance enhancements seeking to become national and international leaders in an increasingly competitive market of fast changing customer requirements (Bottani, 2009). Research has shown that product development projects were more likely to succeed when they were based on carefully defined customer needs than those based on new technological opportunities (Chong & Chen, 2010). In fact, standardized products and mass production will not achieve a big market share anymore while agility and flexibility of the processes and the procedures will do. Manufacturing industries must forecast change in demands with high precision, and at the same time they have to act fast to unexpected additional changes (Homburg, 2019).

The main constraints that every manufacturer has are the high prospects his customers have towards quality and reduced costs to stay competitive in the market. Companies that are coping with the technology that will sustain their presence on the market are the ones that will be able to have rapid product development as well as flexible production (Chen, 2015).

According to experts from the industry and academia, the upcoming industrial revolution will be triggered by the Internet, which allows communication not only among humans, but also among machines in Cyber-Physical-Systems (CPS) throughout large networks (Brettel, Friederichsen, Keller, & Rosenberg, 2014). These networks will be able to link the products and the machines with the employees who would be enabled to remotely control and improve machines' performance. Cloud database would collect the product data, and software systems would be the link to enable real time monitoring of all indicators (Homburg, 2019). Using these technologies, manufacturing enterprises would have more flexibility and agility to meet the demand and keep their customers satisfied. To integrate this technology, major changes will have to be implemented on the given company's processes and the flow of activities, yet major challenges that would impede the process would have to be expected (Chen, 2015).

The challenges can be multi-dimensional, namely organizational, strategic, cultural and managerial. (Nahrkhalaji, Shafiee, Shafiee, & Hvam, 2018). One challenge is to have a culture that accepts this change, a culture that allows to break organizational silos to succeed in the digital space (Euchner, 2018). Another one is having the needed external and internal capabilities. There are strategic partnerships that need to be formed, because that's the best way to build capability in most cases (Euchner, 2018). And the company needs to form its own capability especially on the technological level. On the strategy level, the business model will have to be modified. What has always been the hardest thing for successful companies to do in this regards has not been navigating the changing paradigm of technology but navigating business-model shifts (Euchner, 2018). Leadership has also a challenging role in the transformation. The change cannot happen without the support from top managers who can foster a corporate culture that effectively drives digital transformation (Nahrkhalaji et al., 2018).

One approximate mean of avoiding risks or growing risk consequences in the supply chain is to utilize usable knowledge across the whole supply chain. A digital supply chain allows tangible possible risks, helps businesses to monitor resource movements and generate strategic strategies in real time (Barros et al., 2012).

Improved efficiency and response time of industrial / logistical processes usually is the key catalyst for plant digitalization (Bogner et al, 2016) which will be further explored in this study.

1.2- Need for the study

While digital transformation has its challenges, existing research indicates that the digital phenomenon is an opportunity to innovate and redefine how organizations do business (Heavin & Power, 2018). Digital transformation helps in creating agile organizations that will be a must for survival of businesses in the upcoming years (Garson, 2012).

The economic situation in Lebanon is forcing the government to rethink its economic model by relying more on agriculture and manufacturing. Moreover, the manufacturing sector can contribute to increasing the exports and thus rebalancing the ins and outs (Gates, 2014).

The value added of the manufacturing sector per capita has more than doubled between 1990 and 2015 moving from USD 268 to USD 703 (in constant US dollars per capita) (Gates, 2014).. Industrial exports stood at USD 2.61 billion in 2017, accounting for 92% of total Lebanese exports. The Ministry of Industry developed a strategic plan 2020-2025 for the

sector to increase productivity and industrial exports (Ministry of Industry, 2019). To be able to cope with the revolution and keep the export levels on the rise, Lebanese manufacturing industries need to adopt the digital change and go through the inevitable transformation. By taking this step, Lebanon can be the leader in the region and set the example for others to follow.

Market and technical powers needed to handle transition and make choices faster than ever before the arrival of COVID-19. These demands have been greatly increased by the pandemic. There was never any pressure from businesses of all sizes to adapt their market strategies to evolving demands. And there would only be a transient need for pace – digitization, globalization, robotics, analytics and other changing factors will continue to accelerate (Abigail, 2021).

Leading businesses harvest tremendous gains from using versatility of size to succeed and prosper in this more competitive, insecure, dynamic and contradictory environment. Enterprise agility helped reconstruct a group of high performance teams, each having a specific mission and the expertise it requires. In their early days of agility, these teams performed their largest positions in the digital corners of businesses, bringing together engineers, testing staff, data scientists, consumer travel experts and designers of user interfaces). Agile businesses have made better adjustments to COVID-19 than other companies. They have expedited their work and adapted to emerging worlds in industries with their goals and used practices like targets and main outcomes. Also, agile teams perform really effectively in remote environments on a weekly and regular basis (Poley, 2020).

1.3- Purpose of the study

New digital technologies present both game-changing opportunities for—and existential threats to—companies whose success was built during the pre-digital economy (Sebastian et al., 2017). The future of manufacturing is a challenge for all manufacturing companies, at the same time it is an opportunity to improve and become more efficient on the internal level within the departments and on the external level with the suppliers and the customers. Few businesses already started the change process and others are still unaware of it (Gates, 2014).

In the present research we will explore the awareness and readiness of the manufacturers in Lebanon for the digital transformation. The study is expected to help the companies to have a better understanding of the change needed to achieve this level of technological improvement.

The main research questions are:

1) To what extent the manufacturing industries in Lebanon are aware and ready for digital transformation?
2) What are the main barriers for a company's readiness for digital transformation?

Answering these two questions will enable us to understand the essentials for a successful digital transformation as well as explore the main elements required for the transformation.

1.4- Brief overview of all chapters

The present is divided into five chapters: Introduction, Literature Review, Methodology, Findings and Analysis, Recommendations and Conclusions. The introduction displays a brief acquaintance with the subject and its importance for the future of manufacturing, the research questions are also stated. In the Literature Review the most important resources are investigated in order to come up with a theoretical analysis. The chapter on Methodology defines the research questions and identifies the main sources that will be used for data collection. The chapter Finding and Analysis will clarify the results and presents an analysis of the data collected. This chapter will also allow the validity check of the results. The chapter on Recommendations and Conclusions is the last chapter that will summarize the key findings and the recommendations of digital transformation for the business and the industry.

Chapter 2 – Review of literature

2.1- Introduction

After having introduced the background of digitalization in the first chapter, the goal of this chapter is to present a detailed literature about digital transformation. An exploration of the literature is carried out in order to have a clear picture of the current knowledge of digital transformation and the factors that cause the main impact on the manufacturing companies. NDU library and search engines helped target different documents such as books, dissertations and research about digital transformation, digitization, agility, automation, management and leadership to cover the whole subject. Articles dating from the 1990s allowed us to observe the sequence of events and advancement of the global economy and industries over time. More specifically, the review of the literature is divided into three parts, Industry 4.0, digital transformation and digitalization of the manufacturing enterprises.

2.2- Industry 4.0

Industry 4.0 is not a trend. It comes from a chain of events that led to the search for new solutions responding to the labor shortage experienced in Western countries in recent years, to the globalization of industries and to the enthusiasm of electronic commerce (Imran, 2018).

2.2.1- Competitive environment

International market developments in companies of all types have influenced the manufacturing sector. Globalization and ecommerce innovation have provided prospects for development, but at the same time, there are obstacles that involve awareness of the supply chain and uncertainty.

The future includes predicting the effect of e-commerce on manufacturing, retail and delivery, combining the online and offline worlds and gradually developing as alternatives to home supply.

The prospective buyers do not want to wait – they expect the goods – after being purchase – to be distributed. Corporations have to respond to such issues as early as possible (Ghasemi,2012). The high degree of internet penetration, the constant emergence of fresh knowledge and the probability of contrast in terms of commodity features and pricing was fundamentally influenced by the purchasing behavior and consumption habits of customers (Farahani et al, 2015).

The high levels of Internet penetration shifted the purchasing habits of customers and demand trends, creating a high level of competition for managers in the supply chain. Based on the repercussions of the global pandemic, projections for the next few years are globalization and export expansion, supply chain visibility, standardization mechanism and automation, supply chain coordination, versatility in adapting to competitive economies, creativity and new business models (Farahani et al., 2015, Nicolas et al, 2020).

The fast introduction and acceptance of new specifications on the market is necessary to preserve the potential competitive edge. To adapt to changes and automate operations whilst gaining from new digital technology, it is important to consider the developments and impacts on the supply chain management (Glas, 2016).

Supply chain management have a challenge of keeping their business at the forefront of innovation by designing strategies focused particularly on technologies and possibilities in the light of modern supply chains (Glas, 2016).

Digitalization not only affects the way businesses operate but also raises the amount of disruption they face. The present and potential paradigm of supply chain management was greatly affected by new technology such as 3D printing, Internet of Things and social media. Emerging innovations are projected to adapt to some of the Supply Chain Management (SCM) more important problems resulting in decreases in costs and complexities, an improvement in product efficiency or improved control of service rates (He et al, 2017).

Michael Porter (1979) developed the five force model for the analysis of a firm's competitive position. The author demonstrates the competitive structure of companies according to the following five strategic axes:

1. Competition
2. Potential of new entrants
3. Power of suppliers
4. Power of customers
5. Threat of substitute products

According to the author, a company must study its environment by considering these five characteristics to limit potential threats and develop a competitive advantage. He defines competitive advantage as the cost incurred to produce a good or to offer a service, in addition to the value of differentiation. He argues that a company can develop a competitive

advantage by reducing its production costs, or by increasing the differentiation value or by both. He defines the value of differentiation as the unique, tangible and intangible attributes associated with a product or service and which significantly affect the value perceived by the customer. The value perceived by the customer represents the price that the customer is ready to pay for a product.

With the massive arrival of digital technologies in the manufacturing environment, customers are more informed, suppliers have access to a larger pool of customers, products are increasingly being replaced by digital and mobile alternatives (CDs, movies, applications, etc.).

It may be noticed that Porter's model specifically focuses on the impact of a business environment on the development of its competitive advantage. Barney was one of the first to treat value based on resources (Barney, 1991). Unlike Porter (1979), Barney presents the internal means that a company has to generate a competitive advantage. This management framework is based on the fact that all companies have a combination of heterogeneous resources, which have the potential to generate unique value (Barney, 1991). In his RBV theory (Resource based view), the following four criteria must be respected:

1. Resources must have value
2. Resources must be rare
3. Resources must be difficult to imitate
4. Resources should not be easily substitutable

According to Barney, a company that assesses the use of its resources and develops an appropriate strategy to meet these criteria, differs from the competition (Barney, 1991). More recent literature on strategy, demonstrated that in a highly digital environment, the differentiator becomes a crucial issue and can be developed by focusing on (1) the products and services, (2) the process and (3) the relationship between digital transformation and the manufacturing sector (Avasant, 2016); (Weinman, 2015). Moreover, the new technologies inherent in Industry 4.0 now allow companies to collect and analyze their data, review their business models, their products and services, their processes and to improve the involvement of manufacturers and their relationship with their customers.

2.2.2- The potential of Industry 4.0

The investment of companies in channel coordination systems, automation via cyber-physical systems and robotics makes Industry 4.0 the solution of the future. Its objective is to respond to the change in the consumers' behavior, which makes them request personalized products. This force the industry to change its paradigms and practices and move towards personalized mass production also referred to as mass customization. The key principles related to Industry 4.0 are interoperability, virtualization, decentralization, real time capability, service orientation and modularity (Hermann, Pentek, & Otto, 2016).

Interoperability means that a human or a machine can perform several operations. It's also about developing a common computer language which facilitates communication between different computer systems such as machines & software (Helu, 2017).

Virtualization is defined as the ability to create a virtual image of the floor and production process, created by process simulation or by sensors devices integrated into the production process (Bughrin, 2019) .

Decentralization represents the decentralized control policy. It's the ability to allow employees and machines to make quick decisions (notably thanks to Information and Communication Technologies (ICT)) (Bughrin, 2019).

The service orientation represents the reshaping of its business model according to available data. It's about rethinking the way of doing business with the client by not only offering a product, but by a complete and integrated solution via a combination of services and functionalities, now made possible by sensors integrated into the objects (Mubarik, 2016).

Finally, modularity is the ability to separate everything into small sets. It's a unique principle of agile production systems. The product or process of production can be separated to better manage the complexity of a system (Helu, 2017).

New digital technologies, smart and connected, are the key to moving towards a 4.0 environment (Porter & Heppelmann, 2014). In fact, the intelligence of products is their ability to collect and analyze data. Connectivity is the ability to transfer data from an object to another to facilitate information sharing, decision making and analysis of data (Porter & Heppelmann, 2014)

The different levels of scanning depend on (Porter & Heppelmann, 2014) (1) monitoring, (2) control, (3) optimization and (4) autonomy.

- **Monitoring:** is the systematic process of collecting, analyzing and using information to track a program's progress toward reaching its objectives and to guide management decisions
- **Control:** is the activity of ensuring that all the workplace flows are implemented according to the plan of the top management.
- **Optimization**: is the process of making a trading system more effective by adjusting the variables used for Company X's analysis
- **Autonomy**: It is the capability to process a request to fetch a component from its location and to autonomously deliver this component to a specified delivery point, all without human intervention

Surveillance is defined by the use of external sensors and data sources and which allow complete monitoring of production conditions, the external environment and product operations and uses. The ability to monitor also allows one to schedule alerts and notifications in abnormal situations. Control corresponds to the integration of software within the intelligent and connected product, or in the cloud, which allows the control of the functions of the product and personalization of the user experience. Optimization represents the ability to use monitoring and control tools using algorithms to analyze the data and optimize the operations and uses linked to the product in order to improve performance and enable predictive diagnostics, services and repairs. Finally, autonomy combines monitoring, control and optimization to allow autonomous operations in the product, self-coordination of operations with other products or systems, improvement and personalization of the product autonomously and self-diagnosis.

2.2.3- Technologies supporting industry 4.0

The implementation of a business strategy requires the arrangement of resources, be it human resources, finances, technologies and material. Resources are defined as "all assets, capabilities, organizational processes, attributes, information and knowledge, controlled by a firm that enable the firm to conceive and implement strategies that improve its efficiency and effectiveness (Barney, 1991).

With the ubiquity of the Internet and the rapid development of all kinds of technologies, it becomes relevant for companies to properly identify and select those that are most relevant to their reality. The literature review made it possible to highlight the digital technology groups related to Industry 4.0.

Based on the above analyses, we ,ay conclude that the final list of enabling technologies is: advanced manufacturing; additive manufacturing; augmented reality; simulation; cloud computing; industrial IoT; cyber security; and Big Data analytics and customer profiling (Ardito, Petruzzelli, Panniello, & Garavelli, 2019).

Advanced manufacturing: it represents the technological improvements that organizations can use to develop products and processes. It includes the use of simulation software, computer-aided design and manufacturing. In a context of mass customization, many companies offer products with different more or less standard options. CAD systems (Computer Aided Design), CAM (Computer Aided Manufacturing), Parametric CAD and CAM, facilitate product design and generation of programs of CNC/laser/cutting/bending machines for manufacturing. The parameters of the products allow a personalized manufacturing. It also has the advantage to reduce the design time of each product.

Additive manufacturing: it reflects the technologies used to develop 3D objects using computer software. The process consists of successively depositing layers of material according to a computer model program. This technique facilitates the development of prototypes and parts unique and unusual shapes. Materials used for additive manufacturing can be of metallic, plastic, biological or of textile type.

Augmented reality: it is the system that represents a virtual environment in the real world. It also makes it possible to add visual information to reality, in order to facilitate maintenance, assembly, steering tasks equipment, product design, etc. Virtual reality simulates a fictitious environment in which an individual finds himself, in order to visualize phenomena and interact with them. In particular, it facilitates employee training for piloting equipment or simulating a new work environment or again, the use of a new machine to acquire or implant. It can also help perceiving a future plant before executing it.

Simulation: it is the integration of different IT tools and specialized software to model and simulate the performance of a system. Simulation of structure, performance and functions is optimized to be realistic, thus enhancing the product's design quality and success rate for

one-time development. (Zhou, 2013) This will also reduce the start-up time of the machines and increase their availability.

Cloud computing: it allows communication between computer software and hardware over the internet. It is defined as storage and access to data via the Internet rather than a local hard drive Cloud computing offers enterprises and users high scalability, high availability, and high reliability. It can improve resource utilization efficiency and can reduce the cost of business information construction, investment, and maintenance (Wenhong & Yong, 2014).

Internet of things (IOT): defined as "things have identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environment, and user contexts" (Tan & Wang, 2010). The data communicated are collected using computer hardware, also called embedded systems. The data are then analyzed using software. (Mattern & Floerkemeier, 2010) states that we are moving towards a system where (more or less) smart objects actually communicate with users, Internet services and even among each other (figure 1).

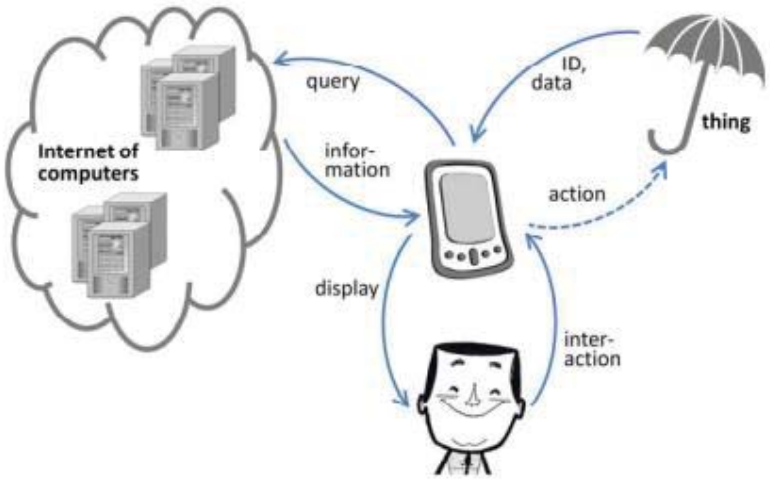


Figure 1 The smartphone as a mediator between people, things and the internet (Mattern & Floerkemeier, 2010)

Cyber security: Industry 4.0 takes its value in the transmission and enhancement of data and information processes, systems and people. These new capabilities that things offer opens up fascinating prospects and interesting application possibilities; but they are also accompanied by substantial requirements relating to the underlying technology and infrastructure.(Mattern & Floerkemeier, 2010) This large amount of data flowing between systems and people just like the daily use of the Internet increases the importance of cyber

security. Businesses have to ensure that their operations are secure, in order to operate successfully in the digital manufacturing environment.(Ernst, Frische, & Hamill, 2015)

Big data analytics and Customer profiling: The term "Big Data" represents the massive volume of structured data and not structured. It has recently become a widely discussed topic in business and academia, as it provides a range of new opportunities for businesses. (Ernst et al., 2015)

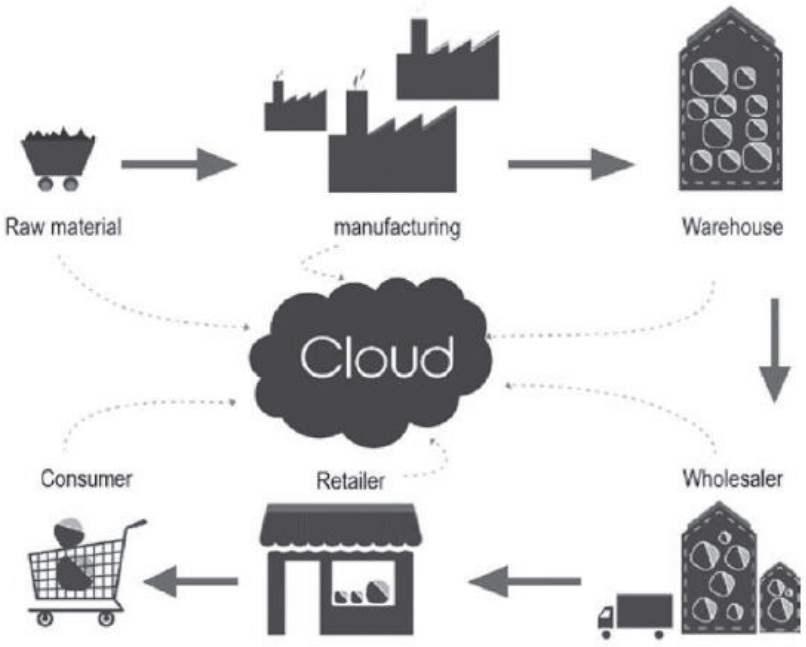


Figure 2 Data of entire supply chain is accessible in the cloud (Kühnle & Bitsch, 2015)

Big Data is collected and processed in the cloud (figure 2). The cloud makes it possible to connect the data to IT tools. In manufacturing IT tools are such as ERP, business intelligence software and customer relationship management (CRM). This interaction notably facilitates decision-making in many contexts. In industry, the use of RFID chips, sensors, actuators and wireless networks for example can store a significant quantity of data in the cloud and Big Data tools are used for further analysis.

As for production management, several systems and software are available to improve customer relationships. Two of these solutions are the customer relationship management (CRM) and remote maintenance systems. A CRM helps to manage the customer relationship by centralizing all information and history related to each client individually. It keeps the data to trace the product, service… Some CRMs allow also to integrate marketing data, customer satisfaction and after-sales support. In short, a CRM system allows to supervise all

interactions between the organization and customers. Remote maintenance represents all of the actions taken in place to provide remote support directly on equipment. Remote maintenance can be accomplished via remote control software, by phone or videoconference.

Big data analytics: This extends to the application of detailed statistics on all form of electronic correspondence collected, including "messages, alerts and pictures shared on social networks, sensor readings and GPS signals (Helu, 2017). Big data analytics lead to growing time for production, strengthening consumer interactions and increasing the productivity of the supply chain. Big technology helps businesses to gather vast amounts of data from images, posts, sources of clicks and others. Data mining has a significant effect on the sustainability of the supply chain (Helu, 2015).

Cloud computing: It applies both to the technologies offered as Internet-based infrastructure and to the equipment and software in data centers "(Helu, 2010). The cloud-based application synchronizes supply chain control with an organization's IT infrastructure. It aims to reduce savings of supply chain processes, scalability, flexibility and performance.

3D printing or direct digital manufacturing: 3-D printing utilizes manufacturing-based CAD technologies and additives to print products through fusion of different products via laser (Helu, 2012). 3D printing or automated direct manufacturing allows fairly low prices to be reached for limited volumes of manufactured items. (He, 2017) notes that the supply chain is being revolutionized by Amazon by distribution stores where consumers will print more than 200 items. This suggests that the expense of warehousing and distribution is restricted to raw materials which may contribute to the shift to the supply chain.

Drones: Such planes are autonomous and may be found in the supply chain. Amazon, for example, operates in an electronic delivery way via autonomous planes (Waller, 2014). The drones will interpret RFID tags or bar code, Q-code, and send the data to a centralized server network. Use of drones has the bonus of collecting data more quickly in an overhead perspective than human beings utilizing cameras carried by hand to gather the same data.

Mobile applications: It applies to forms of apps for use on handheld telecommunications systems such as a mobile phones or computer, rather than desktop or laptop. The optimization of supply chain processes is smartphone apps such as mobile payment, mobile RFID, bar code inspection, map routing and product optimization.

2.2.4- Interrelationships between Industry 4.0 technologies

The use of different digital technologies offers many advantages especially when they're connected. They are shown Figure 3 where one can see some of the concepts related to Industry 4.0 that have been discussed earlier.

Figure 3 Industry 4.0 technologies Source (Waller, 2014)

Cyber-Physical Systems, Cloud Computing, the Internet of Things and the Internet of Services are the basis of Industry 4.0 technologies (Hermann et al., 2016). They interact with each other to form a complete, autonomous system, close to the customer, while aiming at the same time to improve productivity and efficiency. Industry 4.0's customer approach leads to creating products and services according to a customer experience. By the active participation of the client and the web community in product development, design is nurtured by these external sources and can quickly test products and services with the virtualization, simulation and additive manufacturing. In parallel, data are accumulated in Big Data through the use of several everyday services. With the data connected to the cloud, companies try to discern habits, trends, and behaviors in the life of customers and seize business opportunities and improve their products, services and process. Once the requested products are set for production, the cyber-physical system collects the data and sends them in real time in the cloud via the Internet of Things. Data are analyzed using software and applications developed and hosted in the cloud. The analysis results are then communicated via the IoT network in the cyber-physical system either to machines to automatically execute the required actions, or

to humans for further analysis, and decision support (Hofmann, 2017). The information in the cloud as well as the results of analysis can be sent to managers, operators, suppliers, etc.

This ongoing communication and sharing of information promote integration and coordination between players in the system. This "intelligence" contributes to optimization of production, in particular through cost reductions. Also, robots, machines and all intelligent equipment communicate with each other to make the right decisions at the right time and ensure maximum efficiency. Covered by a web of cyber security, all these exchanges can be done without risk.

For this research, Industry 4.0 is then defined as the use of digital technologies and real-time data to improve decision-making, efficiency and agility of its administrative and operational processes.

2.3- Digital transformation

Digital transformation is the process of using digital technologies to create new — or modify existing — business processes, culture, and customer experiences to meet changing business and market requirements (Reis, Amorim, Melao, & Matos, 2018).

The following subsections address the components of digital transformation, key areas to implement digital transformation, customer experience, operational processes, and business models.

2.3.1- Components of digital transformation

Digital Transformation and Digitalization are similar terms that apply to services, processes and organizational structures throughout IT/IS and web-based enablers; therefore, the connection to management is as vital as companies need to establish management practices to govern these complex transformations (Reis et al., 2018).

2.3.2- Key areas to implement digital transformation

Digital transformation requires strong leadership to drive change; but it also requires a vision for what parts of the company one want to transform (Westerman, Bonnet, & Mcafee, 2014). Executives are digitally transforming three key areas of their enterprises: customer experience, operational processes and business models (Westerman et al., 2014).

Customer experience

Customer experience represents the efforts made to offer more than just a product to the client, in terms of design, associated service and communication throughout the product life cycle (Reis et al., 2018).. The use of data and information technologies makes it possible to develop new business models and create new value for the customer. The active participation of customers in the product development process allows also to meet their specific needs and requirements (Reis et al., 2018).. Moreover, this could be possible in different areas of customer experience and by that we will explore some of these areas in the following section:

Customer understanding: Companies need to understand their customer preferences and needs. Some are taking advantage of what they learned from their previous experiences; others are using social media to see what makes a customer satisfied or unsatisfied. In all cases companies are promoting their products on different digital platforms.

Top line Growth: The use of digital tools is increasing with salespersons who are using them for presentations and sales pitch. Tablets and mobile phones in particular are the digital tools salespersons are using to better engage and interact with customers. Some are using CRM's to link customer's local references. These systems facilitate via the Ethernet real time offers and promotions.

Customer touch points: After sales and customer service can be improved using digital tools. They can be used for some consultancy jobs that can be accomplished online and save the customer or the supplier from go physically and to solve the problem. These tools allow the customer to save time, while saving the company money. Many companies are now offering customer apps to enhance customer touch points (Westerman et al., 2014).

Operational processes

Although customer experience is most obvious benefit of digitalization, however on the processes level the transformation improves the efficiency and productivity of enterprises.

Process digitization: Automation of repetitive tasks allows employees to focus on innovation, creativity and to work on value added activities. also creates streams of data that can be useful in later data mining efforts (Westerman et al., 2014). A product can be guided autonomously during production, using sensors and actuators in real time and in depending on current conditions.

Worker enablement: Work from home is an increasing trend in most companies, it gives employees independence and flexibility at work. Meanwhile, the companies are providing tools and software that would allow employees connect with all departments from their home. While implemented for cost reasons, the tools that virtualize individual work have become powerful enablers for knowledge sharing (Westerman et al., 2014).

Performance management: Using actual and real time measures are essential for managers to make decisions based on real numbers and not on assumptions. This can be applied at the customer level and internally. The level of details that can be reached is also increasing allowing managers to go into the details and develop new fields in manufacturing. Data management is all what the company's activities are aimed to control, protect, deliver and improve the quality of data and information assets of the company**.**

Many corporations' market strategies (e.g., Facebook, Amazon, Alibaba, Airbnb, Uber) are focused on digital technologies. Many businesses are required to develop and adopt new long term technologies for five, ten, twenty or even a hundred years in order to survive. Digitalization or digital change has different functions in this phase. Such terms are now described in depth. Digitalization is the mechanism by which analog / physical objects, for example paper papers and microfilm are produced in digital terms (Westerman et al., 2014).

Accordingly, everything is transformed to a digital medium, and is then used by a computer device for different possibilities, including alerts, medical information, positioning details, identification cards and so forth. Consequently, we have continuing knowledge flows in a digital environment, which increase and boost operational efficiency and reduce the number of required workers (Westerman et al., 2014).

Digitalization is the foundation for transformation and digitalization of processes. Digitization involves digitalization, which also contributes to a combination of digital and physical communications, connectivity, and industry activities, such as omni-channel client support, automated promotion, or intelligent development through a mix of self-sufficient, semi-independent, and manual operations (Huber,2016).

A Digital Supply Chain (DSC) is a sophisticated, demand-driven, effective mechanism for the development of different ways of revenue and market profit for enterprises and through the usage of emerging technology. DSC is not just the automated or physical usage of products and resources, but also how supply chain systems, like cloud and internet of things,

are handled through a large spectrum of creative technology (Huber,2016). (e.g., aerial automobiles, cloud computing).

We may also consider a description of the Supply Chain 4.0 as Internet of Things technology, advanced robotics technology and application of advanced big-data analytics in supply chain management: positioning sensors in anything, networking anywhere, automating everything, and evaluating anything to vastly boost consumer service and efficiency. The utilization of new media resulted in beneficial economic benefits as a consequence of output and usage rationalization as well as the possibility of environmental change. (Huber,2016).

All the above is aimed at creating a modern economic paradigm known as the circular economy. This is an economy based on processes of restoration, optimization, and resource saving, powered by digital technologies which achieve sustainable urban growth and social and economic performance (Hofmann, 2017).

Close-loop production and integrated supply chains are the core principle of the circular economy. Positive or green supply chains mean that positive environmental and economic gains in a conventional supply chain are introduced (Hofmann, 2017).

Such criteria refer to choosing manufacturers, planning, processing, storing, shipping, fair usage, use and disposal. This leads to a new phase of growth and competition for businesses, the circular economy and closed-loop supply chains create new revenue streams and allow profitability for the whole supply chain (Okano, 2017).

The aim of supply chain digitalization in circular economies is to include the required details on critical elements and procedures, overcoming bottlenecks and interruptions, as well as creating opportunities for maximizing main metrics for optimal utilization of capital and cost reductions to meet social, economic, and environmental targets (Mohanty, 2013).

Digital innovations lead to creating creative supply chains with the impact on the ecosystem and the commodity life cycle, not just in the manufacturing phase but also in application, thus reducing costs and mitigating the adverse impacts of development and use (Morabito et al., 2015).

Business models

Digitally modified businesses: In addition to the use of new technological tools, businesses are changing the way they do business to sustain their companies. Some are using digital services around traditional products.

New digital businesses: In addition to using digital modified businesses, some companies are also introducing new digital products that can track the lifecycle of the product. These products can keep the supplier informed about his own products. They will also help the customer to prevent a failure by predicting the wear time of his product.

Digital Globalization: Multinational companies are transforming to become global. These companies benefit from global shared services for finance, human resources and even core capabilities like manufacturing and design. Global shared services promote efficiency and reduce risk as stated by Mortenson (2015)

Digital business transformation is about leadership. (Bowersox et al., 2005) Strong leadership is needed to achieve the change and implement digital transformation. But setting a strategy to know which fields to start with is essential. A company cannot accomplish the full transformation at once. Reinventing business operations to exploit information technology and facilitate supply chain collaboration means examining every facet of every job. (Bowersox et al., 2005) Every action needs to be evaluated and reengineered and every company needs to start from a different component.

2.4- The manufacturing companies

Challenges arising from environmental, economic, and technological circumstances are becoming more aggressive to the manufacturing companies around the world. In order to overcome challenges or preserve these developments and maintain their sustainability, manufacturing companies need to manage their value chain in an agile way (Terzi et al., 2017).

The possibilities for industrial companies are enormous, but so are the challenges (De Carolis, Macchi, Negri, & Terzi, 2017). There are many benefits from Industry 4.0 that can contribute to the economic development of the manufacturing companies. We will first start by defining a manufacturing company, its specific characteristics as well as the importance of organizational and operational agility in this type of companies and then we will go through the main barriers that prevent or delay the implementation of digital technologies.

2.4.1- Definition and characteristics of a manufacturing company

Manufacturing is the practice of producing products. These products are manufactured using raw material, machines, and labor. Final products can be sold to the end customer or to another business (Niesen, 2016).

Manufacturing process includes the activities that transform the raw materials into the final product. It starts with product design that is usually connected to engineering and materials that make the product. Manufacturing processes will transform these materials into the final part required (Imran, 2018).

Organizational and operational agility

In an increasingly digital environment and to develop a competitive advantage, manufacturers must have continuous improvement in terms of products and services. They must have agility in organization and in operations to generate value and stand out from the competition (Norrman, 2004).

Organization agility depends on the knowledge, experience, and inventiveness of its members and in-formation available to them (Ragin-Skorecka, 2016). Organizational agility consists of reactivity, speed, flexibility, and skills. Operation agility has in addition continuous innovation. The development of technologies in the manufacturing environment offers new opportunities such as automation of non-value added tasks by equipment and agile software. These opportunities allow companies to adapt quickly to changes and variations in the environment.

By expanding the definition of organizational agility at the operational level, agility takes the form of an ability to adapt to change, achievable due to continuous innovation and the use of flexible and reconfigurable technologies (Pfohl , 2015). Quick and efficient decision-making and the establishment of an information system relevant and in real time, also relates to agility. Lean manufacturing is often the first step which allows better control of the processes both in production and outside production and detects and eliminates sources of waste. Lean manufacturing accompanied by efficient use of technologies lead to organizational flexibility and better efficiency in resource usage (Teece, 2017).

Organizational and operational agility represent the basics that allow manufacturing businesses to operate in the environment from Industry 4.0. They also allow decisions to be made faster and more efficiently. Operational agility allows them to prepare themselves with the machines and systems that adapt quickly and easily to the client's demand.

2.4.2- Barriers to implementing digital transformation in manufacturing firms

Companies in any sector face a range of challenges in deploying and managing digital transformation. The challenges can be organizational, strategic, cultural or managerial (Nahrkhalaji et al., 2018). This literature on barriers is centered on four dimensions, namely: cultural, organizational, Managerial and Strategic. Each of these dimensions is itself broken down into a multitude of criteria, which were raised by the literature around the theme of digital transformation. The components criteria are briefly defined following Figure 5.

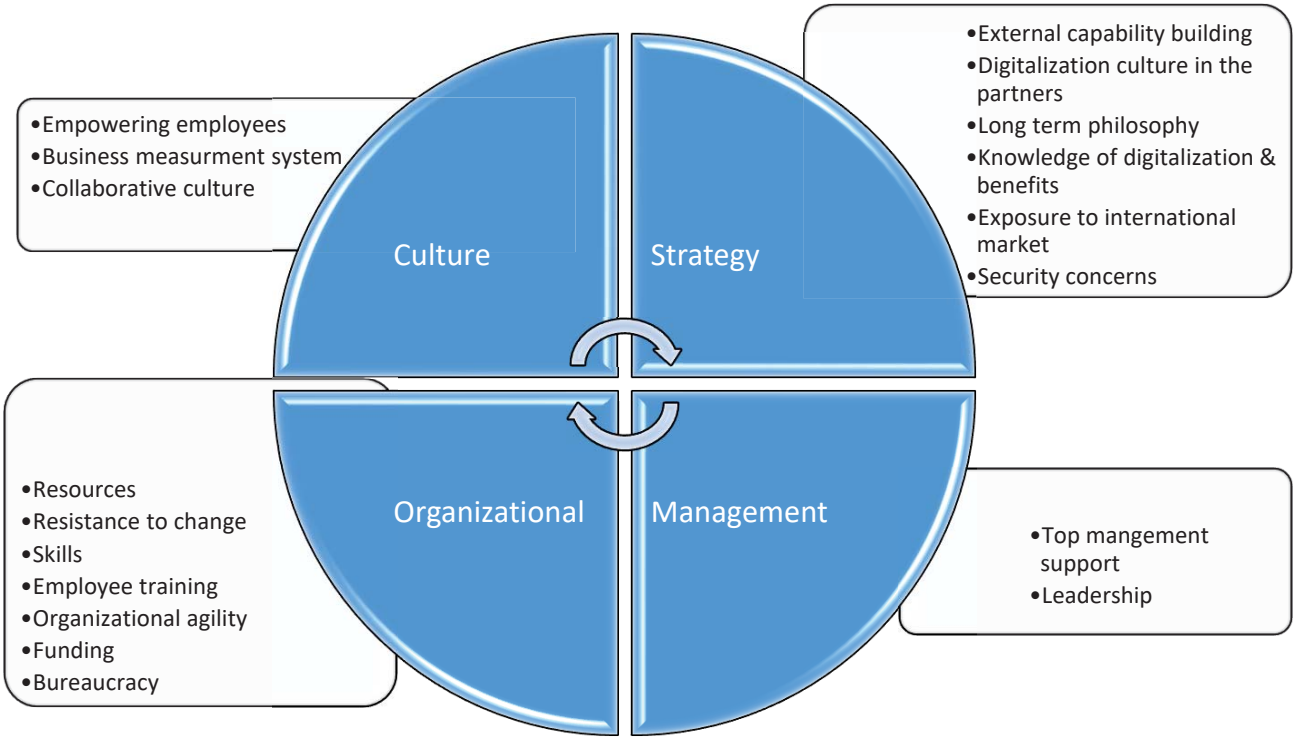


Figure 4 Barriers of digital transformation

Figure 5 Barriers of digital transformation

Cultural

One challenge is to have a culture that accepts this change. One needs a culture that allows one to break organizational silos to succeed in the digital space (Euchner, 2018).

Findings from the IT Sloan Management Review and Deloitte studies on digitalization reveal that that the biggest challenge organizations are facing in accelerating transformation is not

necessarily around the new technology itself, but the cultural change required to derive value from it. Therefore, this highlights the role of humans, of an organizational culture and of the need for formal strategic planning in successful digital transformation. (Nahrkhalaji et al., 2018)

Empowering employees: It is essential to give the employees the means to take control and be more independent so that they embark in digitalization (Ahmed, 2017).

Business measurement systems: The term "Measure" here represents the repeated action of using data and resources related to technology to assess the performance of an organization; in other words, it is about the organization's decision-making system. The company needs to have a suitable measuring system for its data to monitor the effect of digitalization according to Ahmed (2017) .

Collaborative culture: Nahrkhalaji argues that the lack of collaborative culture entails a lack on many other levels such as: engaging employees, improving retention, and increasing innovation which could jeopardize the readiness for digitalization (Nahrkhalaji et al., 2018).

Strategic

This section of the present research addresses the strategic aspects of the digital transformation and its affect the manufacturing industry

External capability building: External capability building is about making strategic partnerships with suppliers. There are strategic partnerships that one need to form, because it is the best way to build capability in most cases to digitalize the value chain (Euchner, 2018).

Digitalization culture in the partners: Digitalization involves many knowledge areas, new digital technologies and platforms, and actors from several industries in new partnerships (Nahrkhalaji et al., 2018).

Long Term philosophy: Digital transformation is a long-term process of change (Sommer, 2015), therefore the absence of a long term philosophy will cause the failure of showing the long-term benefits of this transformation.

Knowledge of digitalization and its benefits: Small- and medium sized manufacturing companies are uncertain about the financial effort required for the acquisition of such new technology and the overall impact on their business model (Schumacher, Erol, & Sihn, 2016).

Exposure to international market: Collaborative work means cooperation between several actors or organizations in order to achieve a common goal. Cooperating is mainly based on sharing values, projects, knowledge, resources, and tools. It is also based on the willingness and ability to cooperate especially when exposed to international markets as the importance of digitalization increases in these situations (Helu, 2017).

Security concerns: IT security involves many levels. Security Can Affect People internal storage data and cloud services as inter and intra communications business. Cyber security then includes development, planning and implementation of security procedures to avoid breaches, information leaks and the risk of hacking. These should be addressed to increase readiness for digitalization (Helu, 2017).

Managerial

The awareness of the managerial team is of high importance to implement the digital transformation in an effective and efficient manner in the manufacturing company.

Leadership: Leadership capabilities are essential to achieving true digital transformation and to turn digital investment into digital advantage (Nahrkhalaji et al., 2018). It is defined by the process used by a person to guide, orient, and influence a group of people with the goal of achieving a common vision. Leadership includes vision and strategy, technological monitoring, commitment, and new business models (Flynn, 2010).

A business vision represents a description of a future and desirable state of the organization and / or its environment. The digital strategy here represents the improvement of products and processes via the use of digital technologies. A good digital strategy must therefore incorporate a long-term vision and a digital plan for achieving its business goals (Flynn, 2010).

Technological monitoring is the set of techniques aimed at organizing systematic collection of technological information, analysis, dissemination and the use of this information for the growth and development of the company. It is about observation and analysis of scientific and Company X’s products, manufacturing processes, materials and the present and future economic impacts they generate (Flynn, 2010)..

Organizational commitment is defined by the strength with which the individual identifies with an organization. This commitment is characterized by these elements: a belief strong and full acceptance of the organization's goals and values; a will to exert a considerable effort on

behalf of the organization, and a desire to remain part of the organization's workforce (He, 2017).

A business model describes the principles by which an organization creates and delivers value. New digital technologies can improve your products or services and the relationship with the client (Helu, 2017).

Top Management support: The change cannot happen without the support from top managers who can foster a corporate culture that effectively drives digital transformation (Nahrkhalaji et al., 2018).

Organizational

Organizational culture is a specific method of the company to respond to problems. It characterizes the company and distinguishes it from others in its values; it is about how to approach problems and how to react to everyday situations. In the model, culture and organization include seven business practices, namely (1) management of change, (2) agility and innovation, (3) investment and resources available, (4) skills acquisition and development, (5) openness to the external, (6) work organization - or lean and continuous improvement, and (7) internal communication.

Resistance to change: Change management refers to the whole process from perception from an organizational problem to the definition of an action framework that allows the development, choice, and implementation of a solution under optimal conditions of success (Higgins, 2004).

Resources: Investing in digital technologies includes the process of determination of a budget, identification of problems and possible solutions, choice of technological solutions, implementation method, monitoring and management of risks (Hofmann, 2017).

Skills needed for digital transformation: Talent management constitutes all the practices linked to the acquisition, developing, and promoting the talents of an organization such as the selection and recruitment, performance management, training and development, succession management, career management and compensation, with the aim of promoting the retention of an organization’s talent (Huber, 2016).

Employees' training: Development of new capabilities and skills is the most significant challenge in digital transformation (Nahrkhalaji et al., 2018) and to develop these skills, adequate trainings must be planned to the employees.

Organizational agility: Agility is the ability of an organization to create value and delight its client, by promoting and adapting – in time – to changes in its environment. Innovation represents the implementation of a product, whether a good or a service, a new or significantly improved process, a new method of marketing or a new organizational method in the practices of the company, the organization of the workplace or external relations (Hughes, 2017).

Insufficient funding: Financing is a major challenge for small and medium enterprises. Investments in Industry 4.0 technologies have to be encouraged by public funding in order to lower the barriers explicitly for SMEs (Sommer, 2015).

Bureaucracy: It is the excessively complicated administrative structure of all processes and procedures. An organization should be agile and flexible to embrace digitalization (Jansen, 2016).

2.5- Conclusion of the literature review

The literature review showed the main barriers that a manufacturing company faces to implement digital transformation. (Sommer, 2015) states that Industry 4.0 is mainly addressed to large companies. This revolution may have the consequence of increasing the gap between small manufacturing enterprises and large industries (Sommer, 2015).

The lack of process digitization and poor performance could possibly affect small manufacturing enterprises compared to their international competitors. Small- and medium sized manufacturing companies are uncertain about the financial effort required for the acquisition of such new technology and the overall impact on their business model. (Schumacher et al., 2016). They do not feel supported by the government, do not know how and where to start, and lack confidence in the security and protection of data.

The clarification of knowledge on Industry 4.0, the manufacturing enterprises and the digital transformation have established the relationship between each of these concepts. Understanding these concepts has validated the relevance of digital in the manufacturing enterprises.

The next step in the research is to determine the most relevant barriers to the readiness of the Lebanese manufacturing industries for digital transformation using the methodology explored in the following chapter.

Chapter 3 - Methodology

3.1- Introduction

This part of the paper will study the methodology that will be implemented in the research. The methodology will deal with the philosophy of the research, the research approach, the sample and population, the data collection procedures, and the hypotheses development and research model in order to answer the research question as follows:

"What are the barriers to the readiness for digital transformation in Lebanon?"

3.2- Philosophical Position

The field was addressed with the supervisors of Company X to devise goals and study concerns which met the company requirements. Semi structured interviews with company X's staff were also performed in order to get a better understanding of the issue. In addition to that, the research implemented a survey for data collection which had been distributed throughout the means of google forms, and had been treated later using the SPSS statistical tool.

Below is a table which clarifies the differences between the positivism and constructivism.

Positivism	Constructivism
Existence of an objective reality	Nonexistence of an objective reality
The world exists independent of human beings	Reality is socially constructed
Truth, facts as well as the objective world can be understood by stringent procedures and justificatory standards	Emphasis on meaning and interpretation; focus on how people interact with one another in the construction of the reality
Nonimportance of language	Language is important for the interpretation of reality
Truth transcends culture	Understanding of the world should be culturally and historically specific
Professional knowledge is achieved through objective, experimental and deductive activities	No role of "professional knowledge" as knowledge is derived through the daily interaction between people in the course of social life

Table 1 Comparison between Positivism and Constructivism (Saunders, 1999; Poley, 2000)

Referring to the table, the research will implement the positivism approach since it is focusing heavily on the objective and professional knowledge based on deductive activities.

Moreover, since many theories had been developed in the research before and had been addressed throughout the literature review, this method aims to validate the research hypotheses in order to answer the research question.

3.3- Reasoning Approach

The last stage of the data collection requires the analysis of the digital transformation of the manufacturing sector in Lebanon focused on public repositories and records. The knowledge obtained through the method is used as robustness checks and to verify the outcomes of the interview.

In deductive analysis, an iterative method is usually used throughout the testing, which was also included in this review. An iterative method includes the review and creation of research history, problem-setting, research issues, intent and boundaries. The expertise is used as the study aims to develop new information (Podgorski, 2017).

In addition, this review employed an illustrating analysis methodology that is important if the concept studied is not well described as in this thesis (Qin J, Liu et al., 2016). Initially, the topic was discussed through a literature review to identify hypothesis that could be applicable to the problems tested.

A deductive approach to analysis was used in the literature. This means that the reason for the analysis is the phenomenon found and it is studied such that results can be interpreted according to the current theory. In order to validate the hypotheses and assumptions, current ideas and observations have been merged (Collis & Hussey, 2014).

3.4- Sample & Population

A thorough understanding of the industry's current development cycle in order to analyze the digital transformation of the manufacturing sector in Lebanon. The main origins of secondary data collection are books, journals, policy articles, newspapers, and business studies.

In addition, a thorough understanding of the digital transformation in the manufacturing industry was used to detect processes most affected by the digital transformation of the manufacturing industry as a result of desk research. The link between the company's diverse capabilities and the manufacturing industry's digital transformation was established.

However, the quantitative methodology had been implemented for collecting data from different companies in Lebanon working in the manufacturing sector. The range of companies based on size (Small, medium and large) was intended to cover a broad scope of testing. The number of replies to the questionnaires is 443 respondents. The questionnaires had been distributed using google forms, and the data maintained will be analyzed using the SPSS statistical tool. The sample had implemented at random for employees who work as technicians, supervisors, quality officers in order to answer the survey.

As for the interviews, four interviews had been done in Company X with four different managers to identify the barriers to digital transformation in the manufacturing sector. These managers hold respectively the positions of "Strategy Manager", "Customer Service Manager", "Head of Digital Department", and "Business Analyst". All of the managers work in the same company and they are responsible for the process extending from pre-production to post-production.

Furthermore, a mixed methodology had been implemented in order to study two different points of views and be able to increase the validity of the findings. For instance, the surveys aimed at targeting the perspective of employees, whereas the interviews aimed to target the managers' view. The interviews included targeted questions that required more experience to have an in-depth understanding of the topic. The questionnaire had elements that we previously found in the literature to validate their contribution to the readiness of firms to adopt digital transformation

3.5- Brief Overview about the targeted company

In order to enhance its operating effectiveness and expand its manufacturing potential, company X provides innovative, tailored and high-quality technologies and turnkey lines built to fulfill the customers ' needs in automation and product handling.

With each customer's requirements, company X felt that it should still find the best customized solution. Any consumer who knocks its door, regardless of the scale of his/her activity, is defined by the industry team. Company X aims at tracking the execution of these solutions along with the client in order to help them grow their own company to grow.

Producers of food & beverage, water, dairy, home & personal care, edible and lube oil, Palletizing & Depalletizing, Packing, Crate and Pallet distribution, big bottle lines as well as advanced inspection systems, are the ways to achieve excellence in work performance.

3.6- Research Strategy and Methodology

The thesis focuses on an understanding and description of an emerging phenomenon in real-world environments; this explains why this study chose the mixed research method. Implementing mixed approach in the research is of high importance to study different points of views. Surveys for instance will target employees and technicians working in the companies, as for interviews, they will target more experienced managers and head of departments in the company and by that will support the findings with more details to validate the research hypotheses.

The most critical aspect of analysis is the second phase of data collection. In semi-structured interviews with open-ended questions, the primary data was collected. The purpose of the interviews is to provide a detailed overview into how the industrial sector recognizes and seizes digital innovation possibilities, and assesses the degree to which this particular business has responded to the evolving climate as well as the barriers preventing it from being ready for digital transformation.

The key reason for choosing a mixed approach study, as Strauss and Corbin (2012) state, is to see the world from the participants' viewpoint and to make discoveries which lead to the creation of empirical knowledge. The digital transformation is, as already mentioned, a poorly studied phenomenon. An exploratory analysis is thus essential to further explain the phenomena.

By taking into account a particular hypothesis the data are gathered, and formulation of hypotheses will benefit from the data review.

Semi-structured interviews give detailed qualitative data as detailed answers to questions (Bryman 2012). Furthermore, semi-structured interviews allow the interviewee to explore an idea or response in more depth (Gill et al. 2008). There are two objectives for the interviews.

The first is to discuss how businesses perceive and become the key agents of the digital transition. The second is to analyze a company's position in the digital transformation of production processes in terms of diverse capabilities.

The participants were also selected on the basis of their respective role in the organization. In the production, financial and marketing departments the interviewees evolved as much as possible.

Interviews were held with the managers / decision makers responsible for the (innovation) plan of the business and employees with different manufacturing firms engaged in a manufacturing cycle. In all three phases of production (pre-production, production and post-production), all the interviewees were questioned, from product design to customer dispatch.

At the start of the project, the participants were approached by email. For the intent of this report, interviews have been performed. The respondents were primarily based in Lebanon. The interviews all took place in Lebanon and lasted 30 minutes on average.

As for the survey, it had been constructed based on the research variables found in the literature, and had been distributed using google forms for data collection. The maintained sample is 443 respondents, and – as mentioned earlier -- the data will be treated using SPSS statistical tool for data analysis and treatment to validate the research hypotheses.

3.7- Case study

Case studies are the preferred strategy in which a contemporary phenomenon is investigated within a real context and in the early phases of the research on a topic (Yin, 2003). The study focuses on understanding the current dynamics in single environments (Eisenhardt 1989). Several sources of evidence are used and triangulated in case study research in order to analyze a chosen phenomenon (Saunders, Lewis and Thornhill, 2008). Although case studies are most often linked to qualitative data, they can also use quantitative data.

A case study investigation is used in this thesis because of these factors. The multiple case study strategy was selected in this study. Yin (2003) distinguishes four approaches for case studies that are focused on two dimensions: (1) single event vs. multiple cases; (2) integrated vs. implemented.

The first dimension examines the number of studies, and the second dimension examines the analytical unit, i.e., if several units in one case are studied. Since the field of digital transformation is recent and companies utilize diverse strategies around industry, several sectors and companies have been chosen.

In turn, a holistic analysis unit was chosen, because the focus was on how businesses transform digitally. In one individual case study, the phenomenon would have been investigated instead of examining the digital phenomenon.

These were still preliminary research questions and were reinforced by the collection of more information. Next, from the specified population the cases were selected. Extreme cases were chosen using information-oriented filtering. This was a good way of maximizing the usefulness of information from small samples and obtaining information on extraordinary cases of particular interest.

Next, many approaches have been selected to collect data from the sector. In order to accelerate the analyses and understand the aspects that need to be modified in the data collection, data collection and analysis have been overlapped. Throughout data analysis, different approaches were utilized to take account of common trends and particular events, including conferences, business meetings, financial reports and newspaper stories.

The study of the cases started when adequate data is obtained. Initially, individual interviews were examined and then a cross-examination and cross-case pattern search began to see evidence through multiple lenses. The initial hypotheses were formed based on the constructs retrieved from the data. This was an iterative method by tabulating and testing facts for each house.

Cross-case analysis helps the original conclusions to be accepted or rejected. The evidence of causality behind relationships was searched to establish internal validity. Conflicting results and related studies were also contrasted. This analogy acquired internal significance, enhanced the theoretical level and enhanced the meaning and generality of the system. Finally, the last step was to achieve theoretical saturation, where new data results have improved only slightly. However, this was not always feasible owing to the short master's thesis timeline and data restrictions.

The study aimed at researching growing drivers culminated in some improvements and added value while digitizing the supply chain of a major manufacturing business. This was done using the approach to case studies. A case study may be used as a testing technique incorporating the use of various sources of scientific knowledge on a certain condition within its actual life background.

Moreover, if the researcher desires to obtain a clear understanding of the research background and the associated methods, the case study methodology is of benefit (Saunders, et al. 2009). The researchers may often concentrate on a single subject or organization helping them to analyze multiple variables or opinions in depth (Boyer & Swink 2008). Inspired by Saunders

and Boyer & Swink and as researcher, I found that the case study method was ideal for the context and intent of this research since it has the potential to offer responses to "Why? "What? "And" How is this possible? Moreover, in performing exploratory studies an approach to case study is necessary (Saunders et al. 2009).

The first step is to pick a suitable case while undertaking a case analysis (Saunders et al., 2009). All the data on value enhancement and drivers for efficiency changes had then to be gathered externally. There were many requirements for choosing businesses for this case study. This is how the data gathered should be relevant and equal to Company X.

The first requirement being that the businesses should be the same scale as Company X. In addition, the goal was to research businesses offering Information & Communications Technology (ICT) services.

In the case studies, ultimately, the companies examined were selected based on the literature and publications on the digitization of supply chain firms listed in some situations, internal X records, unstructured interviews with Company X and the fulfillment of the requirements.

Data for the many case studies were collected through companies' interviews. For each particular business case, all gathered material from multiple interviews was assembled into a case report.

3.8- Interview Coding

The companies involved in the case studies have been interviewed with their key employees. In order to gain a clear viewpoint on the operation of the digitized supply chain, four managers from company X were consulted. The intention was that at least one person from each of the following divisions should be interviewed: production management, procurement, distribution and warehouse departments. The managers in these divisions have been focusing is that they are similar and immediately influenced by digitalization.

Managers of these divisions often collected reports on consumer loyalty, an important perspective when deciding if the digitalization was effective. Prior to the interviews, all interviewees obtained a brief history of the research and the questions and the goals. The interviewees were also well equipped for the interviews. In addition, all the interviewees were granted anonymity to engage in the study safely.

In the interviews, a semi-structured methodology was used to understand which drivers make, create improvements and impact added value through digitalization. This ensures the

interviewer to compile a collection of subjects and problems about which the conversation is to be addressed (Collis & Hussey, 2014). The topics and concerns can differ from one interview to another.

In addition, detailed questions are often required to address study problems inside a given company (Collis & Hussey, 2014). The interviews were documented and recorded, and notes were taken during the process along with the transcription of the interviews according to the dictionary of codes.

3.9- Pilot Study

A pilot study was done to get a comprehensive view of the issue. Unbuilt interviews and meetings were used in the pre-study. The business president and two other managers attended one initial meeting which was aimed at providing a review of the proposal and presenting a general overview of the topic. Following the meeting many unstructured interviews were undertaken with managers in production, procurement, distribution and warehouse departments at Company X in order to devise problem type, to identify parameters for the study and to generate relevant solutions and actions that should be implemented.

3.10- Data collection procedures

The data collection procedure in this thesis is explained in detail in this section. First, the collection method is provided for companies as well as the profile of case firms, then the methodology is explained on how to collect data.

A wide variety of techniques has been used in data collection to study selected companies' digital transformation. Interviews with managers and consultants were the main source of data. In the result pages, the names of the interviewees will not be disclosed to ensure privacy. The interviews lasted between 20 and 60 minutes. The interviews have been carried out on semi-structured forms.

In order to gain an understanding of the industry and of business situation, the first interviews were carried out with company consultants. The interviewed managers were chosen to have extensive experience in the selected company.

They were therefore people who were responsible for customer relations or people who had worked for a long time in the cases.

Interviews were with four different managers in the same company. During the interviews, detailed aspects were covered pertaining to the importance of digital transformations and its effect on the supply chain performance.

The candidates were chosen from the highest management level of the. This could remove biases and imprecise reports and thus make the research more valid (Huber and Power, 1985). A brief summary of the main conclusions of the interview was addressed after the interviews. In addition to the interviews, secondary information was collected from media articles, business websites and annual reports. Media articles were collected through search articles in which company managers discuss their digital transformations.

Websites and presentations from companies were a good way to see how enterprises give priority to digital transformation. Some companies emphasized the communication of their efforts in digital transformation, while others did not. It was possible to learn in social media how executives of companies advocate their digital transformation, which in turn generated interesting remarks, as will be discussed in the following section. By combining these different secondary data sources, the research constructs validity which improves the accuracy of reality (Rajesh, 2016).

Furthermore, the quantitative methodology had been addressed using a survey-based questionnaire which had been entered into google forms. This google form had been distributed for a sample of 600 respondents, and only 443 respondents answered the surveys. The data will be maintained throughout downloading the excel file from google forms and uploading them into SPSS for statistical analysis and hypotheses validation.

3.11- Data Analysis

The questions in the interview were developed with the focus on dynamic capacity and digital transformation. The application of emerging technology, including big data analytics, cloud storage, and artificial intelligence in the production cycle, is defined in Digital Transformation. The interviews were recorded, transcribed and translated into English. Moreover, the collected data were analyzed by using a code system for the complete transcripts of the interview.

The research began after the first interviews. The records were moved from audio files to digital notes. The interview transcripts which made the data volume to grow were evaluated

using a coding system. The topics used in the interview guide were initially used to categorize emerging codes. A second-level of coding is then applied using theory-centered frameworks in an iterative process (Roth, 2016).

The first-tier structures were specific quotations from the interviewees as an indication of this phase in the drivers of the digital transitions of companies. Secondary constructions, such as 'Consumer wants improvement,' have proven to be the engines of digital transformation.

Such factors were grouped into aggregate third-level interventions, subjects such as 'social pressure to adjust.' Because the used analysis was of an iterative procedure, some drivers first were classified as false aggregates and had to again to be classified to achieve consistent categorization.

The data obtained have been examined along with ideas as an interrelated and collaborative method created and checked. Data review before and after processing tends to form the course of data collection continuously. Ideas and hypotheses have been applied to evidence from the case study gathered. During the verification process on whether similar evidence occurs in the majority of the cases to be tested, the scientist noticed essential trended, habits to interactions that tend to change potential data collection. The hypotheses were classified after each sub-question to treat the details from case studies in a systematic way.

This was designed to explain the drivers used to digitize a supply chain, the improvements created by the drivers and, essentially, what is the benefit the improvements bring. The value add was evaluated in the conceptual sense to get a more comprehensive understanding of value added related to each conductor and transition, after categorizing empirics in each sub-category.

The dictionary of codes mentioned in Appendix C of this research, will cover the companies' characteristics including the number of employees working in the addressed company, the mission and vision of the company, the company's gross income, the CSR practices implemented by the company; it will also include different contexts such as the technological infrastructure, culture, managerial and strategic context in addition to other external factors which might may impact the digital transformation in the addressed company.

However, the quantitative methodology will also be implemented in the research by constructing a survey based on the research variables and distributing it over 443 respondents for data collection and the collected data will be treated using SPSS statistical tool.

3.12- Reliability and Validity

The analysis of the trustworthiness of the research (Rajesh 2016) is essential for the reliability of the project. Through documenting and then transcribing the interviews, the precision of analysis is improved. Growing interview addressed and evaluated the same set of questions.

Before and during the interview, participants received all the subjects and necessary explanations to make sure they understood the questions in detail.

To check and endorse the findings, in-depth interviews transcriptions had been conducted. When it is appropriate to the scientific group (Qin, Liu, Grosvenor , 2016), the quality of qualitative analysis is guaranteed. The study was based on research strategies and data collection techniques to be acceptable to the research community (Biggam, 2008). The researcher used a fitting method (interviews) for gathering the details to ensure that the aggregate evidence fulfills the goals of the study.

As for the questionnaire, the validity and reliability test will be conducted based on the Cronbach Alpha indicator for each variable. The rule of thumb states the following:

If the Cronbach Alpha is below 0.5, this means that the data are not valid

If the Cronbach Alpha is between 0.5 and 0.7, this means that the data are valid but contains bias

If the Cronbach Alpha is above 0.7, this means that the data are valid and ready for statistical analysis.

Noting that the validity and reliability test (Factor Analysis) will be conducted for each variable to ensure validity.

3.13- Model and Hypotheses Development

Companies in any sector face a range of challenges in deploying and managing digital transformation. The challenges can be organizational, strategic, cultural or managerial (Nahrkhalaji et al., 2018). Each of these dimensions is itself broken down into a multitude of criteria, which were raised in the literature around the theme of digital transformation. Those barriers could have a negative effect on the readiness of organizations for digital transformation.

Innovation opportunities for most industries will be improved with the introduction and development of emerging technology. Nevertheless, about 90% of creative innovations are unchanged because of a lack of corporate ability to offer new goods or services. The present research is intended to assess organizational preparation for Digital Transformation in a formative multidimensional system.

Such a framework will promote cumulative inquiry into the function of digital technologies and help to control the preparation of the enterprise. The proposed building consists of 21 factors grouped under seven sub-constructs: availability for services, IT, cognitive preparation, readiness for cooperation, encouragement of creativity, cultural preparedness and strategic readiness.

H1: The cultural barriers have a negative effect on the readiness of organizations for digital transformation

International market developments in companies of all types have influenced the manufacturing sector. Globalization and ecommerce innovation have provided prospects for development, but at the same time, such obstacles involve awareness of the supply chain and uncertainty.

The future includes predicting the effect of e-commerce on manufacturing, retail and delivery, combining the online and offline worlds and gradually raising the number of alternatives to home supply.

The prospective buyers do not want to wait; they expect the goods to be purchased and distributed and concerned corporations have to respond to such issues as early as possible (Farahani et al. 2015a). The high degree of internet penetration, the constant emergence of fresh knowledge and the probability of contrast in terms of commodity features and pricing were fundamentally influenced by the purchasing behavior and consumption habits of customers (Accenture, 2015). Thus, strategic barriers might impede the readiness of corporations.

H2: The strategic barriers have a negative effect on the readiness of organizations for digital transformation

In an increasingly digital environment and to develop a competitive advantage, manufacturers must have continuous improvement in terms of products and services. They must have agility

in organizing and in operating in order to generate value and stand out from the competition (Rajesh, 2016).

Organization agility as a managerial choice depends on the knowledge, experience, and inventiveness of its members and in-formation available to them (Ragin-Skorecka, 2016). Organizational agility consists of reactivity, speed, flexibility and skills. The development of technologies in the manufacturing environment offers new opportunities such as automation of non-value added tasks by equipment and agile software. These opportunities that are based on managerial choices enable companies to adapt quickly to changes and variations in the environment. Thus, their absence might become a barrier to organizational readiness for digital transformation.

H3: The managerial barriers have a negative effect on the readiness of corporations for digital transformation

There was no emphasis on why certain fields, such as architecture, engineering and construction), have lagged behind in digital transformation. The concern is whether there are industry-level characteristics that restrict digital transformation. Podgorski (2016) analyzed the relationships between organizational barriers and digital development options across digital technology implementation and usage. The conclusion was that the features of the sector; an emphasis on day-to-day practice, a heterogeneous customer side that is not capable of placing demands on contractors and subcontractors and a product which raises barriers to process innovation effectively curb digital transformation which are all considered organizational barriers.

H4: The organizational barriers have a negative effect on the readiness of organizations for digital transformation

It is predicted that digital transformation (DT) would influence numerous divisions in corporations. The information and communication processes shift as technology fuses with industrial practices. Modification will allow efficiency and new businesses. But several businesses have trouble driving further their digital transformation.

The research stated that there is a direct negative relationship between external barriers and the digital transformation, the higher the external barriers are implemented, the higher the digital transformation will be postponed.

H5: The external factors barriers have a negative effect on the readiness of organizations for digital transformation

3.14- Ethics

For study, ethical studies for humanities and social sciences must be complied with. There are four main criteria of the Research Council which science must fulfill. Both questionnaires and interviews had passed the IRB board for approval to ensure the anonymity of the questionnaires and the interviews and to protect the confidentiality of the respondents who are answering the questions.

The first concept is to remind participants who were examined of the intent of the research (Blomkvist & Hallin 2015). The first concept is that knowledge is required. In this research, the aim of the analysis, which ensured the first premise was fulfilled, was conveyed to each interviewee.

In addition, interviewees were asked whether they would like to contribute to the research voluntarily. This means that the second condition that both participants decided voluntarily to participate is fulfilled (Blomkvist & Hallin, 2015).

The third criterion is alluded to as the provision for secrecy, which includes protection of the data gathered. This ensures that knowledge gathered, and data generated cannot be openly exchanged and that private corporations and organizations can also be retained (Blomkvist & Hallin 2015).

The research firms are kept confidential in this research. In addition, businesses are not identified in depth to ensure that readers from outside the studied businesses are not able to recognize them.

Finally, all of the data gathered during this analysis is only used strictly for this study's intent and evaluation.

This means that the fourth and last condition, recognized as the prerequisite for successful usage, has been satisfied. It notes that the whole collected material can only be used for the research purposes mentioned (Blomkvist & Hallin, 2015). Ethically, analysis is often provided in published and spoken form in order for some to see how unbiased the experiments are and for some to analyze the findings alone (Blomkvist & Hallin, 2015).

Both origins and references are therefore described in this analysis accurately and extensively. In addition, quotations are explicitly described using inverted commas and source detail. There are include ethical standards which must be taken into account during testing, improving their legitimacy and reliability and guaranteeing that there is no plagiarism (Blomkvist & Hallin, 2015)

3.15- Conclusion

The above study aimed at reviewing the methodology that will be implemented in the present research for data collection. In this research a mixed approach was implemented throughout the questionnaires. The questionnaires were distributed through google forms. The interviews were held with four different managers in company X in order to understand the barriers that could impact the readiness of manufacturing organizations for digital transformation.

Finally, the research implemented a deductive approach since it will rely on previous studies and theories in order to validate the research hypotheses; it will also follow the positivism philosophy in order to validate the hypotheses and will rely on both interviews and questionnaires to identify the effect of certain barriers on the readiness of organizations for digital transformation.

Chapter 4 – Findings and Analysis

4.1- Introduction

This chapter of the research addresses in deep the analysis of the interviews and analysis of the data collected using google forms and analyzed using SPSS. The interviews will be analyzed through interviews coding as to the quantitative data, it will be analyzed using variation analysis, factor analysis and regressions to validate the research hypotheses.

4.2- Interview Analysis and Discussion

The present research aims at explaining the treatment of digital transformation among company X operating in Lebanon.

This research gives insights into company X operating in Lebanon. Both quantitative and qualitative methodologies had been implemented to identify how company X is coping with digital change in the manufacturing process. This research was planned to explore the digital transformation challenges in depth and the interaction between the digital phase and the complex capability system.

Secondary data were likewise obtained from internet databases and advice papers; all these data were used to highlight further how the transformation is occurring in manufacturing companies in the light of the digital age.

Company X is experiencing immense changes as emerging digital innovations are implemented. The modeling process is converted by means of 3D software from paper-based technologies into a fully digital one. Moreover, manual labor is supplemented by automated equipment to maximize efficiency and precision by using the manual process. Finally, warehouse processes and coordination of the whole procedure were turned into an integrated method during the delivery period, improving process precision and productivity. Analysis reveals that company X is already in a transformational period **according to interviewee 1.**

The primary process stays with awareness of automation, Internet of Things, increased realism and simulation. Exhibitions and forums of several the tools utilized by respondents for the extraction of knowledge on the subject. Rarely businesses have an internal research and development process which helps them to recognize trends more comprehensively.

However, interviewee 2 stated that R&D not only lets the business grasp the pattern but also helps to recognize openings and improvements in the industry more readily and rapidly. R&D does not only support customers. The mission of sensing is mainly to cooperate with

external collaborators and to externalize R&D activities that help to find business opportunities for small enterprises.

After sensing, the right mechanisms for taking advantage of those opportunities are critical for a corporation. Company X is redeveloping the market paradigm would make it possible for the emerging innovations to capture demand. In order to recognize and prevent assets bottle neck that can emerge through this transformation phase, small businesses utilize complimentary assistance from external stakeholders **according to interviewee 3.**

Interviewee 4 stated that company X should not only restructure its plans, but should also have streamlined decision-making protocols to eliminate mistakes and partialities during the digital transformation process. Company X was successful in catching the advantages that it may achieve from emerging technology by inspiring and engaging their workers in digital transformation.

The main barriers explored by each interview are summarized in the below table:

Interviewee one	Interviewee two	Interviewee three	Interviewee four
Lack of resources	Lack of clear Business measurement system	Lack of resources	Lack of trainings
Resistance to change	Resistance to change	Resistance to change	Resistance to change
Lack of skills	Challenges with partners	Security concerns	Consumer is not willing to adapt
Consumer is not willing to adapt	No incentives from the government		Lack of financial investment
Find the right partner	Lack of financial investment		Security concerns
Limited success stories and previous reviews	Security concerns		Stability in the country

Table 2 Barriers according to interviewees

A list of all the barriers mentioned in the interviews is summarized in the table below:

Barriers
Lack of resources
Lack of skills
Consumer is not willing to adopt
Find the right partner
Limited success stories and previous reviews

Lack of clear Business measurement system
Challenges with partners
Lack of incentives from the government
Lack of financial investment
Security concerns
Lack of trainings
Resistance to change
Lack of financial investment
Stability in the country

Table 3 Summary of the barriers from the interviews

The list of barriers deducted from the interviews was used to create the questionnaire and explore the significance of each barrier on the awareness about the benefits, awareness, and readiness for the implementation of digital transformation.

In summary, the task of capacities is facilitated in particular by restructuring the company model and by developing of a transformational strategy for employees. The effective identification and adaptation to Company X opportunities contribute to its growth and sustainability.

The capacity to turn or reconfigure properties and systems is a prerequisite to retaining the competitive edge. The significance of employee participation in decision-making was both stated by the interviewees.

By reconfiguring properties and systems, businesses would be able to gain greater liability for the strategic actions such that "a more thorough and expedient recognition of opportunities and threats". Awareness is another essential feature of the potential for transformation listed by the respondents. It is highly critical that staff and existing business knowledge capital be enriched and established in order to derive value from emerging innovations.

Furthermore, rewards are structured to enhance and reward workers for the change.

Finally, the position of company X is mainly facilitated by improving the expertise of employees in favor of manufacturing digitalization and providing them with incentives to participate in the transformation.

Company X should also invest in expanding its workforce to facilitate the introduction of emerging technology.

Furthermore, the finding confirms that digital transformation is necessary in order to address challenges of weak market analysis and a simpler and more accurate method of managing competitiveness with regard to major problems facing the apparel industry.

4.3- Quantitative Analysis

4.3.1- Reliability analysis

The present research tested reliability and internal consistency using the Cronbach's Alpha coefficient of reliability.

Cronbach's Alpha for the 22 variables was used to assess the barriers for the readiness of the manufacturing companies for digital transformation. It yielded 93.8% representing a good reliability since it is above 70%.

4.3.2- Descriptive statistics

Gender

Respondents in the data collected data, 297 were males which represent 67.3% and 144 of the respondents were females which represent 32.7%. Even though we didn't have a standard distribution between the percentages of males and females answering the questions, the sample represented the population since in the manufacturing industry we usually find more males than females due to the nature of work.

Age

239 respondents who are aged between 31 and 40 answered the questionnaires constituting 45.1% of the total sample addressed. Followed by people aged between 26 and 30 corresponding to 132 respondents and representing 29.9%. The most targeted positions are the first line managerial ones that have more expertise and knowledge in the manufacturing field. This explains why these two groups scored the highest percentages.

Education Level

The data collected showed that the majority of respondents held a master's degree with 216 responses and a percentage of 49%, followed by 157 with bachelor's degree with 35.6% percentage. The minority of 8 respondents or 1.8% had a Grade 12/Terminal. The educational level of respondents shows the degrees that the majority of engineers require a bachelor's degree. It also shows the post graduate master's degree that is a standard for most managerial positions.

Current position in the company

The data shows that 256 respondents representing 58% of the total sample who answered the questionnaire hold managerial positions in their companies: top managers, general managers, operations managers, production managers, quality managers and regional managers. Followed by 123 respondents representing 27.9% for holding an engineering position and the minority with 62 respondents and 14% for other positions like operators, assistance, foreman, and others. This corresponds to the findings pertaining to the education level.

Years of experience in the company

The majority of respondents representing 34%, have worked in their companies between 6 to 9 years. Followed by 28% who worked for 1 to 5 years and 23% who worked between 10 to 15 years. 11% have more than 15 years of experience and 4.5% have lower than 1 year of experience in their current company. The above figures show that the survey have reached different groups of people with reasonable distribution of the number of years spent in their current company.

Total years of experience

The majority of respondents representing 29%, have worked for more than 15 years as total work experience. Followed by 28% who worked for 5 to 10 years and 24.5% who worked between 10 to 15 years. The above figures show that the respondents have good total work experience which allows them to have a good judgment on the barriers that might encounter a manufacturing company who is willing to implement digital transformation. The data shows that more than 50% of the respondents have more than 10 years of experience. This corresponds to the findings related to the large percentage of respondents having managerial positions.

4.3.3- Variation analysis

Company Establishment Year

As can be seen from the data, the highest proportion of participants was those who work in companies that were established between 1980 and 1990. They represent 40% of all respondents, followed by 30% who work in companies that were established before 1980. These correspondents to the fact that most manufacturing firms were established more than 30 years ago.

We conducted a variation analysis (chi-square test) to study the relationship between years of establishment and all dependent variables since it scored a p-value below than 0.05. Furthermore, in order to understand specifically if young firms have more or less readiness, awareness and awareness about the benefits than older firms, we did a Mann Whitney test on each couple of this categorical variable.

	Awareness about benefits	Awareness	Readiness
	Mean	Mean	Mean
1980-1990	141.07***	147.32***	143.11***
1990-2000	97.21***	82.50***	92.41***
1980-1990	106.17*	107.60***	
2000-2010	70.88*	60.25***	
1980-1990	108.77*	108.58*	
2010-Present	73.54*	74.71*	
1980-1990	173.86***	185.06***	
Before 1980	134.48***	119.51***	

Table 4 Variation analysis on company establishment year

The table above summarizes the results of the tests. All results with insignificant values were not taken into consideration. It can be noted that the companies established in the period between 1980 and 1990 scored the highest means in the awareness about benefits, the awareness, and the readiness. They scored the highest mean among all the groups which means that companies established in these 10 years were more aware about digitalization and their benefits and are more ready for digitalization. Digital transformation became an actively discussed topic in the late 1990s. Companies established between 1980 and 1990 were using more computerized processes and implemented some kind of digital transformation at the early stages of the company founding. This explains why the means for this group are higher in all variables when compared to companies established before 1980s. Also, when

*** P≤0.001
** P≤0.01
* P≤0.05

examining that sample, most of the manufacturing companies that were established during these 10 years are multinationals and operate in different countries, this explains why for these variables the means are also higher than newly established companies.

Number of employees

The number of employees in companies in which, most of the respondents' work is between 100 and 200 representing 67.8% of all sample. More than 80% of the respondents work in enterprises consisting of 40 to 200 employees. This percentage shows that most of the respondents work for small and medium manufacturing companies which are our field of study.

The chi-square test studying the relationship between the number of employees and the dependent variables is significant as the p-value scored 0.00 which is less than 0.05, meaning that there is a direct relationship between number of employees and the dependent variables.

We used the Mann Whitney test to understand the relationship between the number of employees and the different dependent variables for each 2 groups of the different options.

	Awareness about benefits	Awareness	Readiness
	Mean	Mean	Mean
40-100	139.69***	133.08***	145.68*
100-200	189.57***	190.94***	188.32*
Less than 10	122.69***	131.19***	147.18***
100-200	206.30***	204.08***	197.31***

Table 5 Variation analysis on number of employees

The table above shows the significant variation. The companies employing less than 10 people and the ones having between 40 and 100 employees had lower scores on awareness of digitalization, awareness about the benefits of digitalization and readiness for it when compared to companies having 100-200 employees. This means that the bigger the company is, the bigger the influence it has on the awareness, awareness on the benefits and readiness for digital transformation. For instance, most of the companies in that group have an exposure to international markets, meaning that they are forced to implement advanced technology to

boost their operations and by that implementing digitalization to boost productivity. In that case, awareness of benefits, awareness and readiness to digitalization are of high importance to cope with changes and to cope with competitors in the market.

Company yearly turnovers

The results of the yearly turnover question showed that 214 respondents work in companies with turnover above 5 Million dollars representing 48.5% of the sample. More than 50% of the results show that the turnovers of the companies are above 1 Million dollars. This is aligned with the results from the number of employees showing that bigger companies were targeted to have more reliable data.

The chi-square studying the relationship between company year turnover and the dependent variables was significant as seen in the appendix, meaning that there is a direct relationship between company yearly turnover and the dependent variables. We proceeded with a Mann Whitney to understand the relationship between the yearly turnover and the different dependent variables for each 2 groups.

	Awareness about benefits	Awareness	Readiness
	Mean	Mean	Mean
1-100,000	39.77*		
1Mill-5Mill	55.91*		
1-100,000	55.82***	62.68***	
Above 5 Mill	124.94***	124.24***	
100,000-500,000	95.88***	93.84***	98.33***
Above 5 Mill	147.51***	148.06***	146.85***
500,000-1Mill	102.57***	101.31***	116.35**
Above 5 Mill	151.37***	151.75***	147.18**
1 Mill-5Mill	111.96***	108.91***	105.89***
Above 5 Mill	162.50***	163.67***	164.83***

Table 6 Variation analysis on yearly turnover

The table above shows that the companies which had a turnover between $1 and $100,000 have a lower awareness about the benefits when compared with companies having a turnover between $1 million and $5 million.. Also, the companies with a turnover that is higher than $5 million, had higher scores when compared with companies having a lower turnover on awareness of digitalization, awareness about the benefits of digitalization and readiness for it. This is due to the fact that the companies which have high turnover might have already implemented some sort of digitalization in their operations or are able to do it financially and thus, could be more ready to improve and develop their operations by upgrading their digitalization techniques.

Type of digital transformation implemented

This question addressed the existence of any type of implementation of digital transformation inside the respondent's company. As seen from the tables, only 13.6% stated that they do not have any kind off implementation of digital transformation and 86.4% stated that they have some kind of digital transformation implemented. The results are logical with the previous results showing that more than 50% of our sample is for respondents who work in big companies 100-200 employees with high turnovers above 1 Million dollars.

The Mann Whitney test was significant for all variables when doing the variation analysis for companies who have implemented some elements of digital transformation compared to those who have not. The comparison of the means as presented in the table in the appendix shows that companies with some type of digital transformation implemented are more aware about the benefits of digitalization, are aware about digitalization and are more ready to continue their implementation which is very logical. In fact, the companies who have experienced some of sort of digitalization are more inclined to continue their journey on it.

Countries operating in

The companies are either operating in Lebanon only or in several countries as they are multinationals in addition to working in Lebanon. The question aimed to identify the difference between multinationals and local companies and their impact on the dependent variables. It can be shown that 94.3% of the respondents work in multinationals and only 5.7% work in local companies. This data is logical and aligned with previous results showing that most of our respondent's companies are medium companies with 100 to 200 employees with above 1 Million dollars turnovers. These companies work in Lebanon and in several other countries.

We also tested the Mann Whitney and the result showed that there was a significance on the awareness and readiness. In fact, companies operating only in Lebanon have less awareness about digitalization and are less ready for it when compared with companies having international operations.

The companies that are multinationals could have a higher awareness and readiness because certain countries require higher standards to implement digitalization in supply chain practices. Furthermore, many seminars and training are conducted throughout the companies to boost awareness and productivity and by that enhancing readiness.

4.3.4- Factor analysis

The factor analysis had been conducted to check for the internal consistency and reliability of the collected data. The Cronbach alpha for the data (mentioned in Appendix C) is 91.3 % which demonstrates a good reliability since it is above 70%. Also, the KMO & significance level had been conducted to check how suitable the data will be for conducting the factor analysis. Our KMO is 91% which is higher than 70%. This means that our data is suitable for Factor analysis. The Significance level has a percentage less than 5%. This means that our model is significant.

Anti-image

The anti-image test had been conducted to measure the sampling adequacy for a variable, it should be above 0.49 for all the variables. It can be noted that for our model all variables have anti-image greater than 0.49, and by that there is no need to remove any variable and rerun the analysis.

Communalities

The communalities table shows the amount of each variable's variance that can be clarified by the factors. The communality for each variable should be at least 50%. The research showed that the communalities are all higher except for the “security concerns” which scored 42.4% and the “consumer is not willing to adapt the digitalization” which scored 30.2%, thus these two variables should be removed from our model. After removing the two variables since they are distorting our study, the factor analysis had been conducted again and the new Cronbach alpha for the data is 94 % which is still good since it is above 70%. Furthermore, after calculating the new Cronbach Alpha, we recalculated the Kaiser-Meyer-Olkin measure

which indicated 91% and by that our data is still suitable for Factor analysis. The Significance level has a percentage less than 5%. This means that the model is significant.

However, a new communality table had been conducted and it showed a rate higher than 50%

The table mentioned in Appendix C shows the amount of each variable's variance that can be clarified by the factors in which lack of empowering employees scored (69.4%), lack of business measurement scored (64.4%), lack of collaborative culture scored (74.7%), lack of external capacity building scored (67.7%), absence of digitalization culture scored (59.6%), lack of long term philosophy scored (70.7%), insufficient knowledge scored (62.7%), lack to exposure to international market scored (54.1%), lack of top management support scored (73.2%), lack of resources scored (68.7%), resistance to change scored (52.1%), absence of skills scored (73.3%) ,absence of training scored (63.3%), absence of agility scored (64%), absence of funding scored (68.7%), bureaucracy scored (56.2%), lack of government incentives scored (74.4%), lack of economic stability scored (75.7%), lack of advanced internet scored (60.5%), legal or regulations scored (55.1%)

The total variance will be explained now for the following reasons:

- We have three factors

- One of the factors explains the data 46.726%

- The second explains 11.438%

- And the third explains 7.253%

- The remaining is not explained by any of our data.

Scree plot

The scree plot also shows that for an eigenvalue of 1, we have between 3 and 4 component number. It means that we will have 3 or 4 factors in our model. From the total variance explained we confirmed that we have 3 factors.

Based on the examination of the fundamental relationships among the variables under each component, the following interpretation has been presented:

Component 1 is termed “Cultural and Strategic challenges” barriers

Component 2 is termed “External challenges” barriers

Component 3 is termed “Organizational challenges” barriers

Factor 1: “Cultural and Strategic challenges” barriers – the first of the three factors. It includes “Lack of Empowering Employees”, “Lack of business measurement”, “Lack of Collaborative Culture”, “Lack of External Capacity Building”, “Absence of digitalization culture”, “Lack of long term philosophy”, “Insufficient knowledge”, “Lack to Exposure to international market”, “Lack of Top Management Support”, “Absence of Training”, “Absence of Agility”, “Bureaucracy”. It accounts for 47% of the variance.

Factor 2: “External Challenges” barriers the second factor accounts for 11.43 per cent of the total variance. A closer examination reveals that these factors include bureaucracy, lack of government incentives, lack of government stability, lack of economic stability, lack of advanced internet, and regulations.

Factor 3: “Organizational Challenges” barriers the third factor accounted for 7.253 per cent of the total variance, and include lack of top management support, lack of resources, lack of resistance to change, absence of training, skills and agility, funding and bureaucracy that prevents the firm from successfully implementing digitalization.

In summary, the interpretation of the barriers factors through the use of the factor analysis was based on a close examination of variables under the three components derived. This study clearly shows that the implementation of digitalization by Lebanese manufacturing firms is associated with many potential barriers.

Factor analysis was used to examine the complex interrelationship between the barriers with the use of correlation matrix which is a systematic grid layout of correlations between all possible pairs of items to identify the fundamental common factors.

Component matrix

The component matrix shows that we have 4 cross loadings. We need to do the necessary rotations to remove all cross loadings.

After doing several methods for rotation (Varimax, Quartimax, Equamax, Direct Oblimin & Promax) we found out that the Varimax rotation gives us the least number of cross loadings with the best distribution between the two factors for the total variance explained.

For this reason, we will use the Varimax rotation to proceed in our analysis.

We still have 4 cross loadings that the rotations couldn’t remove.

We have to remove them from our analysis.

After removing the lack of top management support, absence of training, absence of agility and bureaucracy the new total variance explained, and rotated component matrix are:

Component 1 indicated a variance of 31.741%

Component 2 indicated a variance of 19.586%

Component 3 indicated a variance of 15.463%

Our last job in factor analysis is to save the three factors into variables to be able to use them in other analysis.

We will also name each factor.

Factor 1 will be the Cultural and Strategic challenges

Factor 2 will be the External challenges

Factor 3 will be the Organizational challenges

The cultural and strategic factors had been combined with each other since in Lebanon, part of the strategic plan is to take culture into consideration, and by that referring to our case culture and strategic component had been combined with each-others. Referring to the Lebanese Case culture can be related to the inability of the employees in the manufacturing company to cope with advanced technology in the workplace, and by that the top management is forced to implement a defined strategy.

4.3.5- Regression analysis

We will now do a regression analysis to double check if the items chosen in factor analysis really belong to their factor or they were forced to join a group.

4. 3.5.1 Regression analysis 1: all the variables of factor 1

Referring to the regression analysis, it can be noticed that R squared is 0.912 and R squared adjusted is 0.91 which means that our model represents 91.2% of reality, and we do not have insignificant values, and by that only 8.8% of the variables are not covered in this research. As for the Durbin Watson is 1.554, which means we have a positive autocorrelation since it falls below its average which is 2.

The ANOVA test scored a significance level 0.000 means the P value is < 5 %. So, we reject the null hypothesis and accepted the alternative hypothesis, and by that the mean is the same for all the groups.

Referring to the regressions, it can be noticed that the P value for all the variables is less than 5% except for the “lack of collaborative culture” which scored a P value of 0.158 which is above 5%. Which means all the variables are significant and explains the model except for this variable, and by that this variable should be removed from this factor, they were forced to be in this group. Thus, the insignificant variable will be removed from the coming model.

After deleting the insignificance variable, the new R squared scored is 91.1% and the R squared scored a value of 91%. As for the ANOVA, it scored a significance level lower than 5%, this means that the model is significant, and the null hypothesis is rejected and the alternative one is accepted.

Referring to the regression analysis, it can be noticed that all variables scored a P-Value lower than 5%. These variables constitute Factor 1 in our model which is cultural and strategic challenges

4.3.5.2 Regression analysis 2: all the variables of factor 2

The model showed an R squared of 0.87 and showed an R squared adjusted of 0.8. This means that our model represents 87% of reality, and we do not have insignificant values. Since the variations between the R and R2 are less than 10%, this means that the model is significant.

Our Durbin Watson is 1.606, which means we have a positive autocorrelation since it falls below average which is 2.

ANOVA: Significance level 0.000 means the P value is < 5 %. So, we reject the null hypothesis that the mean is the same for all the groups. P value for all the variables is less than 5% which means all the variables are significant and explain the model.

Referring to the regressions, it can be noticed that the P value for all the variables is less than 5% except for the “Resistance to change” which scored a P value of 0.223 which is above 5%. Which means all the variables are significant and explains the model except for this variable, and by that this variable should be removed from this factor, it was forced to be in this group. Thus, the insignificant variable will be removed from the coming model.

After deleting the insignificance variable, the new R squared scored is 84% and the R squared scored a value of 79%. As for the ANOVA, it scored a significance level lower than 5%, this means that the model is significant, and the null hypothesis is rejected and the alternative one is accepted.

Referring to the regression analysis, it can be noticed that all the variables scored a significance level lower than 5%, meaning that all the mentioned variables in this model constitute factor 2 which is external challenges.

4.3.5.3 Regression analysis 3: all the variables of factor 3

Referring to the model, the R squared is 0.99 and R squared adjusted is 0.95, which is considered an acceptable rate. This means that our model represents 99% of reality, and we do not have insignificant values. However, since the difference between the R and the R2 is lower than 10%, this means that the model is significant. Our Durbin Watson is 1.232, which means we have a positive autocorrelation since it falls under the average which is 2.

ANOVA model scored a significance level 0.000 means the P value is < 5 %. So, we reject the null hypothesis that the mean is the same for all the groups. P value for all the variables is less than 5% which means all the variables are significant and explain the model.

Referring to the regression analysis, all the variables mentioned in this factor constitute factor 3 which is organizational challenges since they scored a P level lower than 5%.

4.3.5.4 Regression between all barriers and the readiness

We had measured all the variables related to barriers with respect to a dependent variable which is readiness. As it can be seen in the appendix some of the barriers including lack of collaborative culture, lack of government incentives, lack of economic stability, lack of advanced internet had a p-value greater than 0.05. Thus, they will be disregarded from the equation. Thus, the R^2 after removing the non-significant variables was 0.172. Accordingly, 17.2% of the readiness is explained by the factors that we will explore below.

Readiness = 8.396 + (-0.398) absence of skills + 0.159 absence of funding + (-0.288) lack of external capacity building + 0.127 absence of digitalization culture in the partners + 0.219 legal or regulations restrictions

Furthermore, it can be noted that the absence of skills and the lack of external capacity building scored the highest betas which means that the absence of skills and external capacity building are the most important barriers to implementing digitalization in the company. For instance, Poley (2020) noted that digitalization requires external capacity building to implement it in an effective and efficient manner and requires a philosophy and strategy for implementation. For the absence of skills, there are critical digital skills needed for a successful digital transformation. The resources can acquire some of the skills with training

and practice. The company also needs to attract new resources with a specific range of capabilities. Each company should look into its business processes and its specific needs to be able to prepare the needed trainings, hire the suitable resources and have a successful implementation.

Barriers
Absence of skills
Lack of external capacity building

Table 7 Barriers affecting the readiness

The above variables should be addressed by companies to enhance readiness to digitalization in supply chain practices and to boost performance and productivity.

The "legal or regulations restrictions" barrier scored a Betta of (0.232) which means that the readiness is higher when there is a lack of regulations. This could be due to the fact that organizations might benefit from the lack of regulations to embark in their journey of digitalization faster without the hassle of bureaucratic paperwork. This is also supported by Kahn (2020). This is supported by Poley (2020) since he stated that lack of regulations can be a factor to boosting digitalization in the workplace, and especially in Lebanon where CSR activities and environmental concerns are absent.

On the contrary, Abigail (2020) stated that absence of funding and philosophy tends to impact the digitalization process in a negative way and by that affecting the organizational performance negatively. This was not supported by previous literature and might be due to the sample characteristics and demographic variables found in the research.

4.3.5.5 Regression between factors of the barriers and the readiness

The model summary showed an R^2 of 0.111. The R^2 value 0.105 indicates how much of the total variation between challenges and the readiness for implementation of digitalization in manufacturing companies. This variation of 11.1% indicates that our challenges are not explaining much the variation of the readiness. Even though these challenges are significant, but this moderate variation means that the readiness could also depend on other factors like enablers. In our study we only focused on the barriers and we did not explore the different enablers.

As for the Durbin Watson it showed auto-collinearity since it scored 1.472 which is below 2 which means it is positive. The ANOVA Table showed a P value lower than 5%, which means that the model is significant.

The Coefficients table provides us with the necessary information to predict the challenges effect on readiness of manufacturing companies. As it can be seen in the appendix the three factors showed a P value lower than 5%, suggesting that all of the factors are significant and should be kept in the regression. In other words, we can reject the null hypothesis that there is no relationship between the two variables and accept the alternative hypothesis that the identified organizational, strategic and cultural challenges are barriers for the readiness to digitalization in manufacturing companies.

The following equation can be concluded:

Readiness = 7.036 + (-0.485) cultural and strategic challenges + (-0.433) organizational challenges + 0.579 external challenges

The higher the absence of cultural and strategic challenges is, the lower the readiness of the organization will be. Referring to a research done by Poley (2020), he stated that absence of cultural and strategic challenges tends to decrease organizational agility. Thus, reducing the cultural and strategic barriers can increase the readiness for digitalization

For factor 2, the Beta scored 0.222 which means the higher the external challenges are, the higher the readiness will be. For instance, having external challenges could push companies to face obstacles while implementing digitalization in the workplace

For factor 3, it scored a Beta of -0.166 which is considered a negative relationship, and by that the relationship is an inverse relationship, the higher the organizational challenges are, the lower the readiness will be.

Furthermore, it is noted that organizational challenges tend to play an important role in the readiness for digitalization in the workplace, the higher the organizational challenges are the lower the readiness for digitalization implementation will be. This is based on the fact that organizational challenges are diversified including culture, social capital, human resources and labor and many others. Besides, organizational challenges can be divided into both internal challenges including human resources and working processes, and external challenges including competition, and economic factors. This can be considered as important

barrier factor to the readiness of the organization to implement digitalized technology in the manufacturing industry.

4.3.5.6 Regression between all barriers and the awareness on the benefits

The Coefficients table provides us with the necessary information to predict the challenges effect on the digitalization of manufacturing companies and the results contributes statistically significantly to the model. As it can be seen, some of the barriers including lack of empowering employees, lack of business measurement, lack of collaborative culture, lack of external capacity building, absence of digitalization culture, lack of long term philosophy, resistance to change, absence of skills, absence of funding, lack of government incentives, lack of economic stability, lack of advanced internet had a p-value greater than 0.05. Thus, they will be disregarded from the model. After removing them, the R^2 scored 17.3% which means that the 17.3% of the variation in awareness on the benefits is explained by the remaining variables.

The following equation was obtained:

Awareness on benefits = 8.986 + (-0.234) lack of exposure to international markets + (-0.154) insufficient knowledge + 0.117 Lack of government incentives

Barriers
Lack of exposure to international markets
Insufficient knowledge

Table 8 Barriers affecting the awareness about the benefits

The lack of exposure to international market, is the most prominent barrier as it has the highest negative beta meaning that absence of internationalization can negatively affect the awareness about the benefits of digitalization in the addressed company. The greater the absence of entry to foreign market, the poorer the awareness of the company would be. Lack of exposure to international market can minimize the awareness of digitalization in the addressed company, because gathering the international experience enhances the experience of the addressed company in digitalization, since for example what is implemented in United

States is not implemented in the MENA region, and in Lebanon, and therefore absence of international presence is considered a barrier to awareness about implementing digitalization.

The insufficient knowledge acts as a barrier to the awareness on benefits since employees which are not educated in the workplace will be considered a barrier for the development of the company and to enhance digitalization. This complies with the research of Abigail (2020) which states that there is an important relationship between knowledge and awareness to boost digitalization.

All of the above comply with the research of Poley (2020) which focus on the importance of exposure to international market and on enhancing employees' knowledge in the workplace to boost digitalization.

4.3.5.7 Regression between factors of the barriers and the awareness on the benefits

The R2 value 0.113 indicates how much of the total variation between in awareness on the benefits of digitalization in manufacturing companies is explained by the identified barrier factors. The low percentage of 11.3% means that the awareness on the benefits can depend on other factors that were not studied including enablers. In our study, the p-value is .000 for factor 1, 0.011 for factor 2, 0.007 for factor 3 which are less than a standard alpha of .05, suggesting that all of the factors are significant and should be kept in the regression. In other words, we can reject the null hypothesis that there is no relationship between the two variables and accept the alternative hypothesis that the identified organizational, strategic and cultural challenges are barriers to the awareness about the benefits of digitalization in manufacturing companies.

This resulted in the following equation:

Awareness on the benefits = 7.702 + (-0.687) Cultural and strategic challenges + (-0.269) organizational challenges + 0.288 external challenges

The higher the absence of cultural and strategic challenges is, the lower the awareness on the benefits of the organization will be. Cultural and strategic challenges tend to impact awareness of the benefits of digitalization since culture is considered a part of the strategy

that is set by the company and by that it will differ from one company to another and from one country to another.

Absence of skills is one part of the cultural and strategic barriers which can affect the implementation of digitalization in the company. Since the gaps between generations in the company for example generation X and generation Z in the addressed company can lead to cultural and strategic barriers in terms of absence of skills since generation X is not able to cope with new technology.

Resistance to change is considered another factor which led to cultural and strategic barriers since employees which want to keep status quo resist change in the workplace and by that affect the readiness for digitalization in the workplace.

For factor 2, the Beta scored 0.288 which means the higher the external challenges are, the higher the awareness on the benefits will be. External challenges tend to increase the awareness on benefits in the organization since it will push the company and the managers to conduct research to study how to manage the organization in face of external challenges and that can include conducting SWOT and PESTEL analysis.

For Factor 3, it scored a Beta of -0.269 which is considered a negative relationship, and by that the relationship is an inverse relationship, the higher the organizational challenges are, the lower the awareness on the benefits will be. These challenges take place because of lack of knowledge or an absence of the culture of digitalization in the workplace which can lower their awareness about the benefits.

4.3.5.8 Regression between all barriers and the awareness

Referring to the regression analysis, it can be noted that absence of skills, absence of funding, lack of empowering employees, lack of business measurement, lack of external capacity, Absence of digitalization culture, lack of long term philosophy, Lack of regulations, Lack of advanced interent , Lack of economic stability, insufficient knowledge, resistance to change, Lack of government incentives, and Lack of collaborate culture were all found to be non significant.After removing them, the R^2 scored 15% which represents the strengths of the relationship between the independent variables and the dependent variablewhich means that the studied variables impact 15% the awareness and by that there are many variables which affect awareness that were not studied in this research.

The equation is as follows:

Awareness = 10.143 + (-0.244) lack to exposure + (-0.125) insufficient knowledge

Barriers
Lack to exposure to international market
Insufficient knowledge

Table 9 Barriers affecting awareness

As for the lack of exposure to international markets, it tends to affect affects negatively the awareness since it is based on strategic implementation and strategy differs from one country to another based on many factors. Thus, what is implemented in Lebanon cannot be implemented in other countries. This complies with the research of Abigail (2020).

At last, insufficient knowledge tend to impact the awareness level in the workplace, the lower the knowledge is, the lower the awareness will be in the workplace. This complies with the research of Mitchel which stated that the higher the training and development and knowledge sharing in the workplace the higher the awareness will be.

4.3.5.9 Regression between factors of the barriers and the awareness

After removing factor 2 (external challenges) that had a non-significant p-value from the regression analysis, it can be noted that the R^2 scored 0.114 indicating how much of the total variation between awareness on digitalization in manufacturing companies is explained by the identified barrier factors. In our study, the p-value is .000 for factor 1, 0.002 for factor 3 which are less than a standard alpha of .05, suggesting that they are significant and should be kept in the regression. In other words, we can reject the null hypothesis that there is no relationship between the about the organizational, cultural and strategic barriers and the awareness of digitalization in manufacturing companies.

This resulted in the following equation:

Awareness = 8.182 + (-0.730) Cultural and strategic challenges + (-0.341) organizational challenges

For Factor one it scored a Beta of –0.306 which means that the higher the cultural and strategic challenges, the lower the awareness of the organization will be. Cultural and strategic challenges can minimize the awareness of digitalization in the addressed company

since the gap between generations in the workplace is considered one of the cultural barriers as they might not be aware about digitalization in the company as a way to gain and sustain a competitive advantage and they might resist change.

For Factor 3, it scored a Beta of -0.143 which is also considered a negative relationship, and by that the relationship is an inverse relationship, the higher the Organizational challenges are, the lower the awareness. Organizational challenges are many and might exist inside or outside the organization and can affect the performance in a negative way. Some organizational challenges include absence of knowledge, and lack training and development. This could explain the negative effect that these might have on awareness as digitalization and its components are usually explored through internal development or external acquisition of knowledge.

4.4- Conclusion

This chapter addressed the findings of the research to study the barriers which impacted the most the readiness and awareness of digitalization. Different statistical techniques had been conducted to study the relationship between the dependent and independent variables of the research. In the upcoming chapter, we will draw the main conclusions, discuss the limitations of the study and potential future research, and explore the theoretical and managerial implications.

Chapter 5 – Conclusion and Recommendations

5.1- Main Findings

Industry 4.0 becomes a solution in the future through the investments of businesses in channel coordination, automation by cyber-physical networks, and robotics. Its purpose is to adapt to changes in the behavior of customers, whereby individual goods are sought. This force the sector to shift paradigms and processes and transition into the customized development of masses which is often called mass customization. Interoperability, virtualization, decentralization, capacity in real time, orienting service and modularity are the main concepts relating to Industry 4.0.

The lack of external capacity building and the absence of skills are the most significant obstacles to the readiness for digitalization in the manufacturing sector as they moderately explain variations in it. Digitalization necessitates external capability development in order to be implemented effectively and efficiently, as well as a theory and plan for adoption. The resources need specific digital skills and capabilities to focus on digital initiatives that improve productivity and reduce costs. This explains how the lack of skills can act as a barrier to the readiness for the implementation. It can also be concluded that a lack of funding, absence of digitalization culture in the partners and legal or regulations restrictions can also be detrimental obstacles to the preparation component even if at a lesser degree.

The higher the lack of cultural and strategic issues is, the slightly smaller the awareness about the potential benefits for the company. Cultural and strategic issues seem to affect understanding of the advantages of digitalization as culture is deemed a part of the policy that is set by the organization and by that it can vary from one company to another and from one nation to another.

Absence of expertise is one aspect of the cultural and strategic obstacles which can affect the adoption of digitalization in the sector. Because the differences between generations in the business for example generation X and generation Z in the discussed company will contribute to cultural and strategic obstacles in terms of absence of expertise since generation X is not able to cope with modern technologies.

The lack of exposure to foreign market is the most prominent obstacle as it has the highest negative beta indicating that absence of internationalization will adversely impact the understanding about the advantages of digitalization in the presented business and awareness about its existence generally although the R2 is low. The larger the absence of access to

international sector, the lesser the awareness of the business will be. Lack of exposure to international market will minimize the awareness of digitalization in the addressed company, since gathering the international experience enhances the experience of the addressed company in digitalization, as for example what is implemented in United States is not implemented in the MENA region, and in Lebanon, and thus absence of international presence is considered a barrier to awareness about implementing digitalization.

The insufficient knowledge acts as a barrier to the awareness on benefits and to awareness since employees which are not educated in the workplace will be considered a barrier for the development of the company and to enhance digitalization. This complies with the research of Abigail (2020) which states that there is an important relationship between knowledge and awareness to boost digitalization.

The findings stated that the bigger the company is, the bigger the awareness, awareness on the benefits and readiness for digital transformation are.

Many businesses in this category, for example, are exposed to foreign markets, which mean they have to deploy new technologies to increase their activities and digitalization to improve efficiency. Knowledge of the advantages, awareness, and willingness to digitize are highly significant in dealing with changing and dealing with industry rivals.

The findings further demonstrate a lower understanding of the advantages of firms with companies having smaller turnover. Compared with companies with lower turnover on digitalization literacy, awareness of the advantages of digitalization and readiness, firms with turnover above $5 million often have better ratings. This is because businesses who have high turnover may already have adopted any kind of digitalization or are in a position to do so financially, and would are more willing to upgrade digitalization strategies and boost operations.

Finally, the results show that multinational firms could be more responsive and ready since certain countries need better requirements to incorporate digitalization of supply chain activities. Often workshops and training courses are held in all industries to increase understanding, competitiveness and preparation.

According to the qualitative interviews, the process of building capacity is supported in part by reforming the business paradigm and developing a transformational approach for workers. Company X's development and survival was supported by successful discovery and

adaptation of opportunities. Maintaining a strategic advantage necessitates the ability to transform or reconfigure assets and structures. Moreover, the interviewees emphasized the importance of employees' engagement in decision-making as well as their empowerment.

Businesses will achieve more accountability for strategic decisions as a result of this, allowing for "a more comprehensive and expedient identification of opportunities and risks." Another important aspect of the capacity for change mentioned by respondents is awareness. In order to reap benefit from new technologies, it is vital that workers and existing market knowledge be enhanced and developed.

Furthermore, incentives are designed to motivate and encourage employees who make a positive difference. Finally, company X's status is aided primarily by increasing employee experience in manufacturing digitalization and offering resources for them to engage in a transition.

5.2- Limitations and future research

This thesis can definitely be treated as an extension to established research, taking into consideration the limited amount of up-to-date analysis carried out in this field.

This knowledge can no longer be entirely up-to-date and future implementation requirements may therefore be restricted. For the qualitative part of this report, only four interviews were administered. Although the number was limited, this step allowed us to have an in-depth understanding of the main barriers to digitalization before conducting the survey-based questionnaires.

However, the results provided cannot be extended because of the small sample size in the qualitative part. Therefore, if the same technique in the same field is utilized by other organizations as the study is very small, it would be possible to achieve different outcomes. Another point is that the manufacturing sector is the main focus of this report. There may also be completely different conclusions if the same research were applied to other industries and firms where digitalization is not a must to achieve a competitive edge.

Thus, only industries which regularly discuss and address digitalization and industry 4.0 will be interested to undertake research based on interviews with industry participants.

Based on these restrictions, qualitative studies with a statistically relevant number of companies participating needs more research. There can also be widespread results of future

research. In comparison, with potential interview partners or research subjects, the same knowledge background may be better used.

Future research could also rely on specific industries. It can also be an excellent area for future research to compare manufacturing firms with companies from other sectors such as service industries.

5.3- Academic and Managerial Implications

This research offers an analysis on the main barriers to digital change on the full spectrum of business models of organizations. In that sense, the thesis adds to existing literature.

Furthermore, this study indicates that several other elements of the company model are often impacted. The largest increases in the value proposition are followed by less sales flow, resource usage and cost structure updates and only marginal core operating modifications.

It should be noted that some of these findings are compatible with research that has been carried out on specific technologies. This study has provided more contributions to the work carried out to resolve the problem of research as a by-product in addition to the planned contributions to the research topic.

This study is the first to tangibly define digital transformation by describing basic digital technologies and criteria for transformation.

The results provide managers with useful information to reduce the obstacles to sensitivity and digitalization, thus enabling an educated modern transformation phase.

This incorporates a systematic method for identifying, in accordance with the business model assessment process as much as possible, the business plan of companies applied by digital transformation and their goals. This allows firms to create more effective and reliable strategic cases in order to ensure transparent and factual investment decisions.

The lack of exposure to foreign markets has a detrimental effect on perception because they are dependent on policy which varies country by country based on several factors. Therefore, in some countries what is introduced in Lebanon is not possible.

Finally, inadequate information in the workplace seems to affect the awareness level, the lower the experience, and the lower awareness at work. The more teaching, growth and information exchange are reinforced in the workplace, the greater the awareness.

5.4- Recommendations

In conclusion, this thesis offers a thorough look into the growth of digitalization and business 4.0. This research is mainly based on the manufacturing sector. Thus, the most practical aspect of this dissertation was industry 4.0, digitalization, new industrial power, and the factors which affect the digital transformation.

It was observed that the major reasons for the advent of digitalization by companies consulted are productivity improvements, declining costs, customer demand and attempts to hold emerging technologies up to date. Potential research can often assess if the removal or expansion of emerging technologies eventually leads to a considerable improvement in organizations' power. Results from this study might reveal if digital processing is a mixture of different technologies or a generalized contemporary definition.

The aim of this study is that these associations are purely empirical, and no triggers are assumed. The causality of such elements offers valuable observations. Measurements or tests would be an ideal way of identifying mechanics in order to determine the cause of the digital transformation.

There are obviously different results from digital changes between industries. Studies specifically targeting these markets provide a particular insight and reports should be compared in order to distinguish differences in performance.

This analysis can be used to determine the impact of other (digital) technologies or to carry out comparative analyses of businesses as a representation of future research organizations.

The manufacturing sectors are now focusing on industrial digitalization principles such as Industry 4.0 or Smart Manufacturing. These principles are supposed to increase the success factors such as efficiency and competitiveness for industries in their supply chains. Although recent studies of digital industries have a number of theoretical premises, they lack evidence for SMEs.

On the other hand, the manufacturing industry is physically moving towards overall digitalization principles, but it barely holds up the correct agile and adaptive attitude. It is recommended that managers should have an agile mindset, especially in the manufacturing context and industrial digitalization.

This mentality can guide managers to consider the relationships of cause and effect between the projects and the causes to improve their success and would allow them to pivot faster.

Any policy that can be shown to be successful can be translated into the company's immediate financial benefits.

Finally, sensitivity to a systemic digital solution may help industry players transcend their unwillingness to cooperate with external experts and contribute to further projects for research between businesses and research institutions. Industry 4.0 and the associated principles of industrial digitalization have a promising future and were accelerated in the best year and having a good understanding of the barriers is essential for expedited transformation and for sustaining competitive advantage.

References

Ardito, L., Petruzzelli, A. M., Panniello, U., & Garavelli, A. C. (2019). Towards Industry 4.0: Mapping digital technologies for supply chain management-marketing integration . *Business Process Management Journal* . https://doi.org/10.1108/BPMJ-04-2017-0088

Avasant. (2016). Digital Enterprise Transformation: Rebooting Business Services for the New Global Economy. *CreateSpace Independent Publishing Platform. ISBN 978- 1514704066*, 1–17.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99.

Bottani, E. (2009). On the assessment of enterprise agility: Issues from two case studies. *International Journal of Logistics Research and Applications*, *12*(3), 213–230. https://doi.org/10.1080/13675560802395160

Bowersox, D. J., Closs, D. J., & Drayer, R. W. (2005). The digital transformation: technology and beyond. *Supply Chain Management Review*. Framington: Peerless Media, LLC.

Brettel, M., Friederichsen, N., Keller, M., & Rosenberg, M. (2014). How virtualization, decentralization and network building change the manufacturing landscape: An industry 4.0 perspective. *International Journal of Mechanical, Industrial Science and Engineering*, *8*(1), 37–44.

Chong, Y. T., & Chen, C.-H. (2010). Customer needs as moving targets of product development: a review. *The International Journal of Advanced Manufacturing Technology*, *48*(1–4), 395–406.

De Carolis, A., Macchi, M., Negri, E., & Terzi, S. (2017). A maturity model for assessing the digital readiness of manufacturing companies. In *IFIP International Conference on Advances in Production Management Systems* (pp. 13–20). Springer.

Ernst, F., Frische, P., & Hamill, J. (2015). I NDUSTRY 4 . 0 / I NDUSTRIAL I NTERNET OF T HINGS - R ELATED T ECHNOLOGIES AND R EQUIREMENTS FOR A S UCCESSFUL D IGITAL T RANSFORMATION : Name of authors : Name of Project Supervisor :, *2015*.

Euchner, J. B. T.-R.-T. M. (2018). Navigating Digital Transformation: An Interview with Satya Nadella: Satya Nadella talks with Jim Euchner about the challenges and opportunities of digital transformation, *61*(4), 11+. Retrieved from http://link.galegroup.com/apps/doc/A546959807/AONE?u=ndul&sid=AONE&xid=064d7362

Heavin, C., & Power, D. J. (2018). Challenges for digital transformation – towards a conceptual decision support guide for managers. *Journal of Decision Systems*, *27*(sup1), 38–45. https://doi.org/10.1080/12460125.2018.1468697

Hermann, M., Pentek, T., & Otto, B. (2016). Design Principles for Industrie 4.0 Scenarios . *2016 49th Hawaii International Conference on System Sciences (HICSS)* . IEEE . https://doi.org/10.1109/HICSS.2016.488

Kühnle, H., & Bitsch, G. (2015). Foundations & Principles of Distributed Manufacturing: Elements of Manufacturing Networks, Cyber-Physical Production Systems and Smart Automation . Cham : Springer . https://doi.org/10.1007/978-3-319-18078-6

Mattern, F., & Floerkemeier, C. (2010). From the Internet of Computers to the Internet of Things . *From Active Data Management to Event-Based Systems and More* . Berlin, Heidelberg : Springer Berlin Heidelberg . https://doi.org/10.1007/978-3-642-17226-7_15

Mertens P, Barbian D (2014) Die Wirtschaftsinformatik der Zukunft – auch eine Wissenschaft der Netze? HMD 51(6):729–743

Mohanty S, Jagadeesh M, Srivatsa H (2013) Big data imperatives: Enterprise big data warehouse, BI implementations and analytics

Morabito V (2015) Big data and analytics: Strategic and organizational impacts. Springer, Cham

Mortenson MJ, Doherty NF, Robinson S (2015) Operational research from Taylorism to Terabytes: A research agenda for the analytics age. European Journal of Operational Research 241(3):583–595

Niesen T, Houy C, Fettke P, Loos P (2016) Towards an Integrative Big Data Analysis Framework for Data-Driven Risk Management in Industry 4.0. In: 2016 49th Hawaii International Conference on System Sciences (HICSS), pp 5065–5074

Norrman A, Jansson U (2004) Ericsson's proactive supply chain risk management approach after a serious sub-supplier accident. International Journal of Physical Distribution & Logistics Management 34(5):434–456

Nahrkhalaji, S. S., Shafiee, S., Shafiee, M., & Hvam, L. (2018). Challenges of Digital Transformation: The Case of the Non-profit Sector. In *2018 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)* (pp. 1245–1249). https://doi.org/10.1109/IEEM.2018.8607762

Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition . *Harvard Business Review* . Boston : Harvard Business School Press .

Pfohl H-C, Yahsi B, Kurnaz T (2015) The Impact of Industry 4.0 on the Supply Chain. In: Kersten W, Blecker T, Ringle CM (eds) Sustainability in logistics and supply chain management: New designs and strategies, 1st ed. epubli GmbH, Berlin, pp 31–58 Plattform Industrie 4.0 (2014) Industrie 4.0: Whitepaper FuE-Themen

Podgorski D, Majchrzycka K, Dabrowska A, Gralewicz G, Okrasa M (2017) Towards a conceptual framework of OSH risk management in smart working environments based on smart PPE, ambient intelligence and the Internet of Things technologies. Int J Occup Saf Ergon 23(1):1–20

Qin J, Liu Y, Grosvenor R (2016) A Categorical Framework of Manufacturing for Industry 4.0 and Beyond. Procedia CIRP 52:173–178

Ragin-Skorecka, K. (2016). Agile Enterprise: A Human Factors Perspective: Agile Enterprise . *Human Factors and Ergonomics in Manufacturing & Service Industries* . https://doi.org/10.1002/hfm.20610

Reis, J., Amorim, M., Melao, N., & Matos, P. (2018). Digital Transformation: A Literature Review and Guidelines for Future Research (pp. 411–421). https://doi.org/10.1007/978-3-319-77703-0_41

Rajesh R (2016) Forecasting supply chain resilience performance using grey prediction. Electronic Commerce Research and Applications 20:42–58

Roth A (2016) Industrie 4.0 - Hype oder Revolution? In: Roth A (ed) Einführung und Umsetzung von Industrie 4.0: Grundlagen, Vorgehensmodell und Use Cases aus der Praxis. SpringerVerlag, Berlin, Heidelberg, pp 1–15

Schumacher, A., Erol, S., & Sihn, W. (2016). A Maturity Model for Assessing Industry 4.0 Readiness and Maturity of Manufacturing Enterprises. *Procedia CIRP*, *52*, 161–166. https://doi.org/10.1016/j.procir.2016.07.040

Sebastian, I. M., Ross, J. W., Beath, C., Mocker, M., Moloney, K. G., & Fonstad, N. O. (2017). How Big Old Companies Navigate Digital Transformation. *MIS Quarterly Executive*.

Sommer, L. (2015). Industrial revolution - industry 4.0: Are German manufacturing SMEs the first victims of this revolution? . *Journal of Industrial Engineering and Management* . Barcelona : Vicenc Fernandez . https://doi.org/10.3926/jiem.1470

Tan, L., & Wang, N. (2010). Future internet: The Internet of Things . *2010 3rd International Conference on Advanced Computer Theory and Engineering(ICACTE)* . IEEE .

https://doi.org/10.1109/ICACTE.2010.5579543

Weinman, J. (2015). Digital Disciplines : Attaining Market Leadership via the Cloud , Big Data , Social , Mobile , and the Internet of Things.

Wenhong, T., & Yong, Z. (2014). *Big Data Technologies and Cloud Computing*.

Westerman, G., Bonnet, D., & Mcafee, A. (2014). The Nine Elements of Digital Transformation.

Zhou, J. (2013). Digitalization and intelligentization of manufacturing industry, (September 2012), 1–7. https://doi.org/10.1007/s40436-013-0006-5

APPENDICES

Appendix A: Statistics tables

Case Processing Summary

		N	%
Cases	Valid	441	100.0
	Excluded[a]	0	.0
	Total	441	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.938	22

Item Statistics

	Mean	Std. Deviation	N
Lack_of_Empowering_Employees	5.71	2.749	441
Lack_of_Business_Measurement	5.58	2.777	441
Lack_of_Collaborative_Culture	5.65	2.896	441
Lack_of_External_capacity_building	5.85	2.509	441
Absence_of_Digitalization_culture	6.07	2.732	441
Lack_of_Long_Term_Philosophy	5.17	2.868	441
Insufficient_Knowledge	5.60	2.974	441
Lack_To_Exposure_To_International_Market	5.17	2.691	441
Security_Concerns	6.50	2.611	441
Lack_of_Top_Management_Support	5.41	2.948	441
Lack_of_resources	6.55	2.662	441
Resistance_to_change	6.71	2.979	441
Absence_of_skills	6.77	2.414	441
Absence_of_Training	6.66	2.721	441
Absence_of_Agility	6.10	2.884	441
Absence_of_funding	6.74	2.732	441
Burearucracy	6.24	2.653	441
Lack_of_Economic_Stability	7.31	2.853	441
Lack_of_Advanced_internet	7.05	2.790	441
Legal_or_regulations	5.37	2.765	441
Consumer_is_not_willing_to_adapt_digitalization	6.13	2.525	441
Lack_of_Government_incentives	6.69	3.079	441

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Lack_of_Empowering_Employees	129.32	1450.079	.750	.933
Lack_of_Business_Measurement	129.45	1463.847	.674	.935
Lack_of_Collaborative_Culture	129.38	1432.567	.792	.933
Lack_of_External_capacity_building	129.18	1477.865	.676	.935
Absence_of_Digitalization_culture	128.96	1473.032	.640	.935
Lack_of_Long_Term_Philosophy	129.86	1442.792	.751	.933
Insufficient_Knowledge	129.43	1458.244	.650	.935
Lack_To_Exposure_To_International_Market	129.86	1474.791	.642	.935
Security_Concerns	128.53	1486.708	.602	.936
Lack_of_Top_Management_Support	129.63	1426.149	.808	.932
Lack_of_resources	128.48	1471.414	.667	.935
Resistance_to_change	128.33	1468.820	.600	.936
Absence_of_skills	128.26	1499.357	.586	.936
Absence_of_Training	128.38	1480.263	.607	.936
Absence_of_Agility	128.93	1445.659	.733	.934
Absence_of_funding	128.29	1475.193	.629	.935
Burearucracy	128.79	1465.804	.698	.934
Lack_of_Economic_Stability	127.72	1513.905	.417	.939
Lack_of_Advanced_internet	127.98	1514.362	.426	.938
Legal_or_regulations	129.66	1504.041	.480	.938
Consumer_is_not_willing_to_adapt_digitalization	128.90	1522.298	.436	.938
Lack_of_Government_incentives	128.34	1515.088	.376	.940

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
135.03	1614.680	40.183	22

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	144	32.7	32.7	32.7
	Female	297	67.3	67.3	100.0
	Total	441	100.0	100.0	

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-25	30	6.8	6.8	6.8
	26-30	132	29.9	29.9	36.7
	31-40	199	45.1	45.1	81.9
	41-50	50	11.3	11.3	93.2
	51-60	20	4.5	4.5	97.7
	Above 60	10	2.3	2.3	100.0
	Total	441	100.0	100.0	

Educational_Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Grade 12 / Terminal	8	1.8	1.8	1.8
	national and Technical education (BT, TS)	46	10.4	10.4	12.2
	Bachelor degree	157	35.6	35.6	47.8
	Masters degree	216	49.0	49.0	96.8
	PhD	14	3.2	3.2	100.0
	Total	441	100.0	100.0	

Current_Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	123	27.9	27.9	27.9
	2	256	58.0	58.0	85.9
	3	62	14.1	14.1	100.0
	Total	441	100.0	100.0	

Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 year	20	4.5	4.5	4.5
	1-5 years	124	28.1	28.1	32.7
	6-9 years	149	33.8	33.8	66.4
	10-15 years	100	22.7	22.7	89.1
	More than 15 years	48	10.9	10.9	100.0
	Total	441	100.0	100.0	

Countries

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Multinationals	416	94.3	94.3	94.3
	Local	25	5.7	5.7	100.0
	Total	441	100.0	100.0	

Total_Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 year	8	1.8	1.8	1.8
	1-5 years	72	16.3	16.3	18.1
	6-9 years	125	28.3	28.3	46.5
	10-15 years	108	24.5	24.5	71.0
	More than 15 years	128	29.0	29.0	100.0
	Total	441	100.0	100.0	

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	144	32.7	32.7	32.7
	Female	297	67.3	67.3	100.0
	Total	441	100.0	100.0	

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-25	30	6.8	6.8	6.8
	26-30	132	29.9	29.9	36.7
	31-40	199	45.1	45.1	81.9
	41-50	50	11.3	11.3	93.2
	51-60	20	4.5	4.5	97.7
	Above 60	10	2.3	2.3	100.0
	Total	441	100.0	100.0	

Educational_Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Grade 12 / Terminal	8	1.8	1.8	1.8
	national and Technical education (BT, TS)	46	10.4	10.4	12.2
	Bachelor degree	157	35.6	35.6	47.8
	Masters degree	216	49.0	49.0	96.8
	PhD	14	3.2	3.2	100.0
	Total	441	100.0	100.0	

Current_Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	123	27.9	27.9	27.9
	2	256	58.0	58.0	85.9
	3	62	14.1	14.1	100.0
	Total	441	100.0	100.0	

Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 year	20	4.5	4.5	4.5
	1-3 years	124	28.1	28.1	32.7
	6-9 years	149	33.8	33.8	66.4
	10-15 years	100	22.7	22.7	89.1
	More than 15 years	48	10.9	10.9	100.0
	Total	441	100.0	100.0	

Total_Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 year	8	1.8	1.8	1.8
	1-3 years	72	16.3	16.3	18.1
	6-9 years	125	28.3	28.3	46.5
	10-15 years	108	24.5	24.5	71.0
	More than 15 years	128	29.0	29.0	100.0
	Total	441	100.0	100.0	

Countries

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Multinationals	416	94.3	94.3	94.3
	Local	25	5.7	5.7	100.0
	Total	441	100.0	100.0	

Digital_Transformation_Implementation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	381	86.4	86.4	86.4
	No	60	13.6	13.6	100.0
	Total	441	100.0	100.0	

Company_Establishment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1980-1990	179	40.6	40.6	40.6
	1990-2000	76	17.2	17.2	57.8
	2000-2010	24	5.4	5.4	63.3
	2010-present	28	6.3	6.3	69.6
	Before 1980	134	30.4	30.4	100.0
	Total	441	100.0	100.0	

Number_of_employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 10	78	17.7	17.7	17.7
	10-40	2	.5	.5	18.1
	40-100	62	14.1	14.1	32.2
	100-200	299	67.8	67.8	100.0
	Total	441	100.0	100.0	

Company_turnovers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1$-100,000$	22	5.0	5.0	5.0
	100,000$-200,000$	58	13.2	13.2	18.1
	500,000$-1 million $	65	14.7	14.7	32.9
	1 million $ - 5 Million $	82	18.6	18.6	51.5
	Above 5 Million $	214	48.5	48.5	100.0
	Total	441	100.0	100.0	

Ranks

	Company_Establishment	N	Mean Rank
Awareness_about_the_benefits	1980-1990	179	259.87
	1990-2000	76	188.21
	2000-2010	24	187.96
	2010-present	28	184.46
	Before 1980	134	201.22
	Total	441	
Awareness	1980-1990	179	278.56
	1990-2000	76	174.83
	2000-2010	24	185.83
	2010-present	28	197.00
	Before 1980	134	181.61
	Total	441	
Readiness	1980-1990	179	242.53
	1990-2000	76	158.97
	2000-2010	24	194.67
	2010-present	26	265.27
	Before 1980	133	218.62
	Total	438	

Test Statistics[a,b]

	Awareness_about_the_benefits	Awareness	Readiness
Chi-Square	29.515	63.813	28.012
df	4	4	4
Asymp. Sig.	.000	.000	.000

a. Kruskal Wallis Test

b. Grouping Variable: Company_Establishment

Ranks

	Digital_Transformation_Implementation	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	Yes	381	239.96	91424.00
	No	60	100.62	6037.00
	Total	441		
Awareness	Yes	381	239.18	91127.00
	No	60	105.57	6334.00
	Total	441		
Readiness	Yes	381	230.50	87819.00
	No	57	146.00	8322.00
	Total	438		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	4207.000	4504.000	6669.000
Wilcoxon W	6037.000	6334.000	8322.000
Z	-7.966	-7.651	-4.733
Asymp. Sig. (2-tailed)	.000	.000	.000

a. Grouping Variable: Digital_Transformation_Implementation

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1980-1990	179	141.07	25252.00
	1990-2000	76	97.21	7388.00
	Total	255		
Awareness	1980-1990	179	147.32	26370.00
	1990-2000	76	82.50	6270.00
	Total	255		
Readiness	1980-1990	179	143.11	25617.00
	1990-2000	76	92.41	7023.00
	Total	255		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	4462.000	3344.000	4097.000
Wilcoxon W	7388.000	6270.000	7023.000
Z	-4.427	-6.571	-5.060
Asymp. Sig. (2-tailed)	.000	.000	.000

a. Grouping Variable: Company_Establishment

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1980-1990	179	106.17	19005.00
	2000-2010	24	70.88	1701.00
	Total	203		
Awareness	1980-1990	179	107.60	19260.00
	2000-2010	24	60.25	1446.00
	Total	203		
Readiness	1980-1990	179	104.58	18720.00
	2000-2010	24	82.75	1986.00
	Total	203		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	1401.000	1146.000	1686.000
Wilcoxon W	1701.000	1446.000	1986.000
Z	-2.830	-3.801	-1.726
Asymp. Sig. (2-tailed)	.005	.000	.084

a. Grouping Variable: Company_Establishment

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1980-1990	179	108.77	19469.00
	2010-present	28	73.54	2059.00
	Total	207		
Awareness	1980-1990	179	108.58	19436.00
	2010-present	28	74.71	2092.00
	Total	207		
Readiness	1980-1990	179	101.68	18201.00
	2010-present	26	112.08	2914.00
	Total	205		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	1653.000	1686.000	2091.000
Wilcoxon W	2059.000	2092.000	18201.000
Z	-2.961	-2.851	-.844
Asymp. Sig. (2-tailed)	.003	.004	.399

a. Grouping Variable: Company_Establishment

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1980-1990	179	173.86	31121.00
	Before 1980	134	134.48	18020.00
	Total	313		
Awareness	1980-1990	179	185.06	33126.00
	Before 1980	134	119.51	16015.00
	Total	313		
Readiness	1980-1990	179	163.16	29205.00
	Before 1980	133	147.54	19623.00
	Total	312		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	8975.000	6970.000	10712.000
Wilcoxon W	18020.000	16015.000	19623.000
Z	-3.862	-6.432	-1.525
Asymp. Sig. (2-tailed)	.000	.000	.127

a. Grouping Variable: Company_Establishment

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1990-2000	76	50.39	3830.00
	2000-2010	24	50.83	1220.00
	Total	100		
Awareness	1990-2000	76	49.68	3776.00
	2000-2010	24	53.08	1274.00
	Total	100		
Readiness	1990-2000	76	48.82	3710.00
	2000-2010	24	55.83	1340.00
	Total	100		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	904.000	850.000	784.000
Wilcoxon W	3830.000	3776.000	3710.000
Z	-.065	-.514	-1.040
Asymp. Sig. (2-tailed)	.948	.607	.298

a. Grouping Variable: Company_Establishment

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1990-2000	76	53.08	4034.00
	2010-present	28	50.93	1426.00
	Total	104		
Awareness	1990-2000	76	51.82	3938.00
	2010-present	28	54.36	1522.00
	Total	104		
Readiness	1990-2000	76	44.87	3410.00
	2010-present	26	70.88	1843.00
	Total	102		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	1020.000	1012.000	484.000
Wilcoxon W	1426.000	3938.000	3410.000
Z	-.326	-.389	-3.900
Asymp. Sig. (2-tailed)	.745	.697	.000

a. Grouping Variable: Company_Establishment

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1990-2000	76	103.03	7830.00
	Before 1980	134	106.90	14325.00
	Total	210		
Awareness	1990-2000	76	106.33	8081.00
	Before 1980	134	105.03	14074.00
	Total	210		
Readiness	1990-2000	76	88.38	6717.00
	Before 1980	133	114.50	15228.00
	Total	209		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	4904.000	5029.000	3791.000
Wilcoxon W	7830.000	14074.000	6717.000
Z	-.447	-.150	-3.026
Asymp. Sig. (2-tailed)	.655	.880	.002

a. Grouping Variable: Company_Establishment

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	322.000	334.000	218.000
Wilcoxon W	728.000	740.000	518.000
Z	-.260	-.037	-1.843
Asymp. Sig. (2-tailed)	.795	.970	.065

a. Grouping Variable: Company_Establishment

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	2000-2010	24	76.67	1840.00
	Before 1980	134	80.01	10721.00
	Total	158		
Awareness	2000-2010	24	83.42	2002.00
	Before 1980	134	78.80	10559.00
	Total	158		
Readiness	2000-2010	24	72.00	1728.00
	Before 1980	133	80.26	10675.00
	Total	157		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	1540.000	1514.000	1428.000
Wilcoxon W	1840.000	10559.000	1728.000
Z	-.332	-.459	-.827
Asymp. Sig. (2-tailed)	.740	.646	.408

a. Grouping Variable: Company_Establishment

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	2010-present	28	77.50	2170.00
	Before 1980	134	82.34	11033.00
	Total	162		
Awareness	2010-present	28	85.00	2380.00
	Before 1980	134	80.77	10823.00
	Total	162		
Readiness	2010-present	26	93.69	2436.00
	Before 1980	133	77.32	10284.00
	Total	159		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	1764.000	1778.000	1373.000
Wilcoxon W	2170.000	10823.000	10284.000
Z	-.499	-.437	-1.674
Asymp. Sig. (2-tailed)	.618	.662	.094

a. Grouping Variable: Company_Establishment

Ranks

	Countries	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	Multinationals	416	224.13	93238.00
	Local	25	168.92	4223.00
	Total	441		
Awareness	Multinationals	416	224.39	93348.00
	Local	25	164.52	4113.00
	Total	441		
Readiness	Multinationals	413	224.39	92673.00
	Local	25	138.72	3468.00
	Total	438		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	3898.000	3788.000	3143.000
Wilcoxon W	4223.000	4113.000	3468.000
Z	-2.129	-2.313	-3.309
Asymp. Sig. (2-tailed)	.033	.021	.001

a. Grouping Variable: Countries

Ranks

	Digital_Transformation_Implementation	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	Yes	381	239.96	91424.00
	No	60	100.62	6037.00
	Total	441		
Awareness	Yes	381	239.18	91127.00
	No	60	105.57	6334.00
	Total	441		
Readiness	Yes	381	230.50	87819.00
	No	57	146.00	8322.00
	Total	438		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	4207.000	4504.000	6669.000
Wilcoxon W	6037.000	6334.000	8322.000
Z	-7.966	-7.651	-4.733
Asymp. Sig. (2-tailed)	.000	.000	.000

a. Grouping Variable: Digital_Transformation_Implementation

Ranks

	Number_of_employees	N	Mean Rank
Awareness_about_the_benefits	Less than 10	78	147.33
	10-40	2	303.50
	40-100	62	187.47
	100-200	299	246.62
	Total	441	
Awareness	Less than 10	78	160.37
	10-40	2	247.50
	40-100	62	175.69
	100-200	299	246.03
	Total	441	
Readiness	Less than 10	75	180.81
	10-40	2	375.50
	40-100	62	182.02
	100-200	299	235.93
	Total	438	

Test Statistics[a,b]

	Awareness_about_the_benefits	Awareness	Readiness
Chi-Square	44.310	38.130	20.802
df	3	3	3
Asymp. Sig.	.000	.000	.000

a. Kruskal Wallis Test

b. Grouping Variable: Number_of_employees

Ranks

	Company_Establishment	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1980-1990	179	141.07	25252.00
	1990-2000	76	97.21	7388.00
	Total	255		
Awareness	1980-1990	179	147.32	26370.00
	1990-2000	76	82.50	6270.00
	Total	255		
Readiness	1980-1990	179	143.11	25617.00
	1990-2000	76	92.41	7023.00
	Total	255		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	4462.000	3344.000	4097.000
Wilcoxon W	7388.000	6270.000	7023.000
Z	-4.427	-6.571	-5.060
Asymp. Sig. (2-tailed)	.000	.000	.000

a. Grouping Variable: Company_Establishment

Ranks

	Number_of_employees	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	Less than 10	78	39.81	3105.00
	10-40	2	67.50	135.00
	Total	80		
Awareness	Less than 10	78	40.04	3123.00
	10-40	2	58.50	117.00
	Total	80		
Readiness	Less than 10	75	38.27	2870.00
	10-40	2	66.50	133.00
	Total	77		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	24.000	42.000	20.000
Wilcoxon W	3105.000	3123.000	2870.000
Z	-1.678	-1.118	-1.780
Asymp. Sig. (2-tailed)	.093	.264	.075
Exact Sig. [2*(1-tailed Sig.)]	.107[b]	.306[b]	.083[b]

a. Grouping Variable: Number_of_employees

b. Not corrected for ties.

Ranks

	Number_of_employees	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	Less than 10	78	63.83	4979.00
	40-100	62	78.89	4891.00
	Total	140		
Awareness	Less than 10	78	68.14	5315.00
	40-100	62	73.47	4555.00
	Total	140		
Readiness	Less than 10	75	70.17	5263.00
	40-100	62	67.58	4190.00
	Total	137		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	1898.000	2234.000	2237.000
Wilcoxon W	4979.000	5315.000	4190.000
Z	-2.201	-.780	-.384
Asymp. Sig. (2-tailed)	.028	.435	.701

a. Grouping Variable: Number_of_employees

Ranks

	Number_of_employees	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	Less than 10	78	122.69	9570.00
	100-200	299	206.30	61683.00
	Total	377		
Awareness	Less than 10	78	131.19	10233.00
	100-200	299	204.08	61020.00
	Total	377		
Readiness	Less than 10	75	148.37	11128.00
	100-200	299	197.31	58997.00
	Total	374		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	6489.000	7152.000	8278.000
Wilcoxon W	9570.000	10233.000	11128.000
Z	-6.103	-5.332	-3.532
Asymp. Sig. (2-tailed)	.000	.000	.000

a. Grouping Variable: Number_of_employees

Ranks

	Number_of_employees	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	Less than 10	78	39.50	3081.00
	More than 200	0[a]	.00	.00
	Total	78		
Awareness	Less than 10	78	39.50	3081.00
	More than 200	0[a]	.00	.00
	Total	78		
Readiness	Less than 10	75	38.00	2850.00
	More than 200	0[a]	.00	.00
	Total	75		

a. Mann-Whitney Test cannot be performed on empty groups.

Ranks

	Number_of_employees	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	10-40	2	51.50	103.00
	40-100	62	31.89	1977.00
	Total	64		
Awareness	10-40	2	43.50	87.00
	40-100	62	32.15	1993.00
	Total	64		
Readiness	10-40	2	55.50	111.00
	40-100	62	31.76	1969.00
	Total	64		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	24.000	40.000	16.000
Wilcoxon W	1977.000	1993.000	1969.000
Z	-1.493	-.869	-1.793
Asymp. Sig. (2-tailed)	.136	.385	.073
Exact Sig. [2*(1-tailed Sig.)]	.168[b]	.438[b]	.080[b]

a. Grouping Variable: Number_of_employees

b. Not corrected for ties.

Ranks

	Number_of_employees	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	10-40	2	187.50	375.00
	100-200	299	150.76	45076.00
	Total	301		
Awareness	10-40	2	148.50	297.00
	100-200	299	151.02	45154.00
	Total	301		
Readiness	10-40	2	256.50	513.00
	100-200	299	150.29	44938.00
	Total	301		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	226.000	294.000	88.000
Wilcoxon W	45076.000	297.000	44938.000
Z	-.604	-.041	-1.735
Asymp. Sig. (2-tailed)	.546	.967	.083

a. Grouping Variable: Number_of_employees

Ranks

	Number_of_employees	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	40-100	62	139.69	8661.00
	100-200	299	189.57	56680.00
	Total	361		
Awareness	40-100	62	133.08	8251.00
	100-200	299	190.94	57090.00
	Total	361		
Readiness	40-100	62	145.68	9032.00
	100-200	299	188.32	56309.00
	Total	361		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	6708.000	6298.000	7079.000
Wilcoxon W	8661.000	8251.000	9032.000
Z	-3.477	-4.038	-2.950
Asymp. Sig. (2-tailed)	.001	.000	.003

a. Grouping Variable: Number_of_employees

Ranks

	Company_turnovers	N	Mean Rank
Awareness_about_the_benefits	1$-100,000$	22	124.82
	100,000$-200,000$	58	178.03
	500,000$-1 million $	65	194.35
	1 million $ - 5 Million $	82	186.56
	Above 5 Million $	214	263.82
	Total	441	
Awareness	1$-100,000$	22	137.41
	100,000$-200,000$	58	175.24
	500,000$-1 million $	65	194.29
	1 million $ - 5 Million $	82	181.56
	Above 5 Million $	214	265.22
	Total	441	
Readiness	1$-100,000$	19	203.47
	100,000$-200,000$	58	177.43
	500,000$-1 million $	65	207.35
	1 million $ - 5 Million $	82	168.70
	Above 5 Million $	214	255.48
	Total	438	

Test Statistics[a,b]

	Awareness_about_the_benefits	Awareness	Readiness
Chi-Square	53.361	54.880	38.331
df	4	4	4
Asymp. Sig.	.000	.000	.000

a. Kruskal Wallis Test

b. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1$-100,000$	22	33.14	729.00
	100,000$-200,000$	58	43.29	2511.00
	Total	80		
Awareness	1$-100,000$	22	33.77	743.00
	100,000$-200,000$	58	43.05	2497.00
	Total	80		
Readiness	1$-100,000$	19	42.16	801.00
	100,000$-200,000$	58	37.97	2202.00
	Total	77		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	476.000	490.000	491.000
Wilcoxon W	729.000	743.000	2202.000
Z	-1.762	-1.604	-.717
Asymp. Sig. (2-tailed)	.078	.109	.474

a. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1$-100,000$	22	30.59	673.00
	500,000$-1 million $	65	48.54	3155.00
	Total	87		
Awareness	1$-100,000$	22	32.77	721.00
	500,000$-1 million $	65	47.80	3107.00
	Total	87		
Readiness	1$-100,000$	19	42.32	804.00
	500,000$-1 million $	65	42.55	2766.00
	Total	84		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	420.000	468.000	614.000
Wilcoxon W	673.000	721.000	804.000
Z	-2.930	-2.460	-.038
Asymp. Sig. (2-tailed)	.003	.014	.970

a. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1$-100,000$	22	39.77	875.00
	1 million $ - 5 Million $	82	55.91	4585.00
	Total	104		
Awareness	1$-100,000$	22	42.68	939.00
	1 million $ - 5 Million $	82	55.13	4521.00
	Total	104		
Readiness	1$-100,000$	19	55.95	1063.00
	1 million $ - 5 Million $	82	49.85	4088.00
	Total	101		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	622.000	686.000	685.000
Wilcoxon W	875.000	939.000	4088.000
Z	-2.254	-1.733	-.822
Asymp. Sig. (2-tailed)	.024	.083	.411

a. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1$-100,000$	22	55.82	1228.00
	Above 5 Million $	214	124.94	26738.00
	Total	236		
Awareness	1$-100,000$	22	62.68	1379.00
	Above 5 Million $	214	124.24	26587.00
	Total	236		
Readiness	1$-100,000$	19	93.05	1768.00
	Above 5 Million $	214	119.13	25493.00
	Total	233		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	975.000	1126.000	1578.000
Wilcoxon W	1228.000	1379.000	1768.000
Z	-4.588	-4.101	-1.631
Asymp. Sig. (2-tailed)	.000	.000	.103

a. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	100,000$-200,000$	58	58.28	3380.00
	500,000$-1 million $	65	65.32	4246.00
	Total	123		
Awareness	100,000$-200,000$	58	57.31	3324.00
	500,000$-1 million $	65	66.18	4302.00
	Total	123		
Readiness	100,000$-200,000$	58	57.72	3348.00
	500,000$-1 million $	65	65.82	4278.00
	Total	123		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	1669.000	1613.000	1637.000
Wilcoxon W	3380.000	3324.000	3348.000
Z	-1.112	-1.404	-1.270
Asymp. Sig. (2-tailed)	.266	.160	.204

a. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	100,000$-200,000$	58	69.09	4007.00
	1 million $ - 5 Million $	82	71.50	5863.00
	Total	140		
Awareness	100,000$-200,000$	58	69.53	4033.00
	1 million $ - 5 Million $	82	71.18	5837.00
	Total	140		
Readiness	100,000$-200,000$	58	71.91	4171.00
	1 million $ - 5 Million $	82	69.50	5699.00
	Total	140		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	2296.000	2322.000	2296.000
Wilcoxon W	4007.000	4033.000	5699.000
Z	-.350	-.239	-.349
Asymp. Sig. (2-tailed)	.726	.811	.727

a. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	100,000$-200,000$	58	95.88	5561.00
	Above 5 Million $	214	147.51	31567.00
	Total	272		
Awareness	100,000$-200,000$	58	93.84	5443.00
	Above 5 Million $	214	148.06	31685.00
	Total	272		
Readiness	100,000$-200,000$	58	98.33	5703.00
	Above 5 Million $	214	146.85	31425.00
	Total	272		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	3850.000	3732.000	3992.000
Wilcoxon W	5561.000	5443.000	5703.000
Z	-4.492	-4.733	-4.200
Asymp. Sig. (2-tailed)	.000	.000	.000

a. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	500,000$-1 million $	65	76.92	5000.00
	1 million $ - 5 Million $	82	71.68	5878.00
	Total	147		
Awareness	500,000$-1 million $	65	78.00	5070.00
	1 million $ - 5 Million $	82	70.83	5808.00
	Total	147		
Readiness	500,000$-1 million $	65	81.63	5306.00
	1 million $ - 5 Million $	82	67.95	5572.00
	Total	147		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	2475.000	2405.000	2169.000
Wilcoxon W	5878.000	5808.000	5572.000
Z	-.754	-1.034	-1.948
Asymp. Sig. (2-tailed)	.451	.301	.051

a. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	500,000$-1 million $	65	102.57	6667.00
	Above 5 Million $	214	151.37	32393.00
	Total	279		
Awareness	500,000$-1 million $	65	101.31	6585.00
	Above 5 Million $	214	151.75	32475.00
	Total	279		
Readiness	500,000$-1 million $	65	116.35	7563.00
	Above 5 Million $	214	147.18	31497.00
	Total	279		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	4522.000	4440.000	5418.000
Wilcoxon W	6667.000	6585.000	7563.000
Z	-4.340	-4.502	-2.721
Asymp. Sig. (2-tailed)	.000	.000	.007

a. Grouping Variable: Company_turnovers

Ranks

	Company_turnovers	N	Mean Rank	Sum of Ranks
Awareness_about_the_benefits	1 million $ - 5 Million $	82	111.96	9181.00
	Above 5 Million $	214	162.50	34775.00
	Total	296		
Awareness	1 million $ - 5 Million $	82	108.91	8931.00
	Above 5 Million $	214	163.67	35025.00
	Total	296		
Readiness	1 million $ - 5 Million $	82	105.89	8683.00
	Above 5 Million $	214	164.83	35273.00
	Total	296		

Test Statistics[a]

	Awareness_about_the_benefits	Awareness	Readiness
Mann-Whitney U	5778.000	5528.000	5280.000
Wilcoxon W	9181.000	8931.000	8683.000
Z	-4.614	-5.008	-5.343
Asymp. Sig. (2-tailed)	.000	.000	.000

a. Grouping Variable: Company_turnovers

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.913
Bartlett's Test of Sphericity	Approx. Chi-Square	6587.295
	df	231
	Sig.	.000

Anti-image Matrices

		Lack_of_Empowering_Employees	Lack_of_Business_Measurement	Lack_of_Collaborative_Culture	Lack_of_External_capacity_building	Absence_of_Digitalization_culture	Lack_of_Long_Term_Philosophy	Insufficient_knowledge	Lack_To_Exposure_To_International_Market	Security_Concerns	Lack_of_Top_Management_Support	Lack_of_resources	Resistance_to_change	Absence_of_skills	Absence_of_Training	Absence_of_Agility	Absence_of_funding	Bureaucracy	Lack_of_Economic_Stability	Lack_of_Advanced_Interest	Legal_or_regulations	Consumer_is_not_willing_to_adapt_digitalization	Lack_of_Government_incentives
Anti-image Covariance	Lack_of_Empowering_Employees	.324	-.098	-.074	.017	-.003	.009	-.024	-.024	-.022	-.032	.004	.043	-.002	-.026	.009	.008	-.051	.009	.021	-.078	-.061	-.014
	Lack_of_Business_Measurement	-.098	.328	-.001	-.106	.009	-.059	-.041	.006	.001	.054	.016	-.040	.048	-.036	-.077	.006	-.013	.036	-.062	.026	.053	.033
	Lack_of_Collaborative_Culture	-.074	-.001	.251	-.073	-.002	-.045	-.005	.017	.027	-.067	-.004	-.045	.007	.004	-.040	.005	.041	-.023	.035	-.036	.027	-.031
	Lack_of_External_capacity_building	.017	-.106	-.073	.293	-.117	.042	-.015	-.066	-.034	-.017	-.042	.060	-.014	-.003	.032	.004	.007	.054	.036	-.013	-.065	-.053
	Absence_of_Digitalization_culture	-.003	.009	-.002	-.117	.379	-.052	-.033	.056	.043	-.077	.004	.038	-.057	-.017	.026	.041	-.051	.004	-.051	.020	-.037	.043
	Lack_of_Long_Term_Philosophy	.009	-.059	-.045	.042	-.052	.297	-.115	-.078	.015	-.037	-.025	1.753E-005	-.037	-.001	.008	.044	-.015	-.031	-.023	.005	.007	.027
	Insufficient_knowledge	-.024	-.041	-.005	-.015	-.033	-.115	.380	-.077	-.079	-.008	.024	-.031	.031	.030	-.016	-.025	.034	.002	.013	.007	.052	-.006
	Lack_To_Exposure_To_International_Market	-.024	.006	.017	-.066	.058	-.078	-.077	.456	-.014	-.035	-.018	.024	.001	-.063	-.002	-.015	.025	.021	-.029	.026	-.073	-.013
	Security_Concerns	-.022	.001	.027	-.034	.043	.015	-.079	-.014	.560	-.030	-.055	-.111	.025	-.041	.005	.029	-.071	-.014	-.030	.012	.033	-.001
	Lack_of_Top_Management_Support	-.032	.054	-.067	-.017	-.077	-.037	-.008	-.035	-.030	.229	-.038	-.041	.065	.002	-.042	-.060	-.008	-.021	.003	-.054	.039	.045
	Lack_of_resources	.004	.016	-.004	-.042	.004	-.025	.024	-.018	-.055	-.038	.344	-.020	-.101	-.031	.047	-.134	-.029	.054	-.030	.023	.010	-.020
	Resistance_to_change	.043	-.040	-.045	.060	.038	1.753E-005	-.031	.024	-.111	-.041	-.020	.424	-.098	.047	-.072	-.002	.032	-.018	.028	.029	-.204	.005
	Absence_of_skills	-.002	.048	.007	-.014	-.057	-.037	.031	.001	.025	.065	-.101	-.098	.357	-.140	-.005	-.073	.007	.030	-.006	-.034	.063	-.018
	Absence_of_Training	-.026	-.036	.004	-.003	-.017	-.001	.030	-.063	-.041	.002	-.031	.047	-.140	.411	-.048	-.002	-.016	-.008	.048	-.010	-.059	.051
	Absence_of_Agility	.009	-.077	-.040	.032	.026	.008	-.016	-.002	.005	-.042	.047	-.072	-.005	-.048	.274	-.035	-.136	-.036	-.050	.066	.057	-.022
	Absence_of_funding	.008	.006	.005	.004	.041	.044	-.025	-.015	.029	-.060	-.134	-.002	-.073	-.002	-.035	.394	.002	-.093	-.030	.032	-.068	.036
	Bureaucracy	-.051	-.013	.041	.007	-.051	-.015	.034	.025	-.071	-.008	-.029	.032	.007	-.016	-.136	.002	.355	-.064	.090	-.069	-.045	-.051
	Lack_of_Economic_Stability	.009	.006	-.023	.004	.004	-.031	.002	.021	-.014	-.021	.054	-.018	.030	-.008	.036	-.093	-.064	.362	-.146	.025	-.034	-.176
	Lack_of_Advanced_Interest	.021	-.062	.035	.036	-.051	-.023	.013	-.020	-.030	.003	-.030	.028	-.006	.049	-.050	-.030	.090	-.146	.493	-.114	-.051	-.072
	Legal_or_regulations	-.070	.026	-.036	-.013	.020	.005	.007	.026	.012	-.054	.023	.029	-.034	-.010	.066	.032	-.069	.025	-.114	.506	-.059	-.131
	Consumer_is_not_willing_to_adapt_digitalization	-.061	.053	.027	-.080	-.037	.007	.052	-.073	.033	.039	.010	-.204	.063	-.059	.057	-.068	-.045	-.034	-.051	-.059	.604	.036
	Lack_of_Government_incentives	-.014	.033	-.031	-.053	.043	.027	-.006	-.013	-.001	.045	-.020	.005	-.018	.051	-.022	.036	-.051	-.176	-.072	-.131	.036	.393
Anti-image Correlation	Lack_of_Empowering_Employees	.951[a]	-.301	-.258	.054	-.010	.029	-.067	-.063	-.051	-.116	.011	.115	-.007	-.072	.030	.023	-.149	.027	.054	-.172	-.138	-.040
	Lack_of_Business_Measurement	-.301	.911[a]	-.004	-.341	.025	-.193	-.116	.017	.002	.197	.047	-.108	.142	-.098	-.257	.017	-.039	.016	-.154	.063	.118	.092
	Lack_of_Collaborative_Culture	-.258	-.004	.944[a]	-.269	-.006	-.168	-.016	.051	.073	-.279	-.012	-.138	.022	.011	-.151	.016	.137	-.076	.100	-.101	.069	-.099
	Lack_of_External_capacity_building	.054	-.341	-.269	.896[a]	-.352	.144	-.046	-.180	-.083	-.067	-.131	.170	-.043	-.009	.112	.013	.023	.167	.099	-.034	-.189	-.155
	Absence_of_Digitalization_culture	-.010	.025	-.006	-.352	.923[a]	-.157	-.089	.140	.094	-.261	.011	.095	-.155	-.042	.080	.106	-.140	.010	-.118	.045	-.078	.112
	Lack_of_Long_Term_Philosophy	.029	-.193	-.168	.144	-.157	.939[a]	-.347	-.216	.036	-.144	-.080	5.022E-005	-.115	-.003	.030	.131	-.047	-.096	-.061	.012	.017	.079
	Insufficient_knowledge	-.067	-.116	-.016	-.046	-.089	-.347	.943[a]	-.186	-.170	-.026	.065	-.077	.083	.076	-.051	-.063	.091	.005	.030	.017	.109	-.017
	Lack_To_Exposure_To_International_Market	-.063	.017	.051	-.180	.140	-.216	-.186	.952[a]	-.029	-.107	-.046	.056	.004	-.145	-.005	-.036	.063	.053	-.042	.054	-.136	-.030
	Security_Concerns	-.051	.002	.073	-.083	.094	.036	-.170	-.029	.953[a]	-.083	-.124	-.227	.056	-.085	.013	.042	-.160	-.031	-.057	.023	.057	-.002
	Lack_of_Top_Management_Support	-.116	.197	-.279	-.067	-.261	-.144	-.026	-.107	-.083	.931[a]	-.137	-.130	.227	.008	-.170	-.200	-.029	-.071	.010	-.157	.106	.151
	Lack_of_resources	.011	.047	-.012	-.135	.011	-.080	.065	-.046	-.124	-.137	.827[a]	-.052	-.269	-.083	.153	-.364	-.083	.153	-.072	.054	.022	-.056
	Resistance_to_change	.115	-.108	-.138	.170	.095	5.022E-005	-.077	.056	-.227	-.130	-.052	.867[a]	-.252	.112	-.211	-.004	.091	-.046	.060	.062	-.402	.012
	Absence_of_skills	-.007	.142	.022	-.043	-.155	-.115	.083	.004	.056	.227	-.289	-.252	.879[a]	-.367	-.177	-.194	.020	.085	-.013	-.080	.135	-.048
	Absence_of_Training	-.072	-.098	.011	-.009	-.042	-.003	.076	-.145	-.085	.008	-.083	.112	-.367	.937[a]	-.143	-.006	-.043	-.020	.107	-.021	-.119	.126
	Absence_of_Agility	.030	-.257	-.151	.112	.080	.030	-.051	-.005	.013	-.176	.153	-.211	-.177	-.143	.908[a]	-.106	-.434	.113	-.137	.177	.140	-.096
	Absence_of_funding	.023	.017	.016	.013	.106	.131	-.063	-.036	.042	-.200	-.364	-.004	-.194	-.006	-.106	.916[a]	.005	-.246	-.068	.071	-.139	.091
	Bureaucracy	-.149	-.039	.137	.023	-.140	-.047	.091	.063	-.160	-.029	-.083	.091	.020	-.043	-.434	.005	.912[a]	-.190	.215	-.163	-.096	-.137
	Lack_of_Economic_Stability	.027	.016	-.076	.167	.010	-.096	.085	.053	-.031	-.071	.153	-.046	.065	-.020	.113	-.246	-.190	.798[a]	-.345	.059	-.073	-.497
	Lack_of_Advanced_Interest	.054	-.154	.100	.099	-.118	-.061	.030	-.042	-.057	.010	-.072	.060	-.013	.107	-.137	-.068	.215	-.345	.843[a]	-.228	-.093	-.163
	Legal_or_regulations	-.172	.063	-.101	-.034	.045	.012	.017	.054	.023	-.157	.054	.052	-.060	-.021	.177	.071	-.163	.058	-.228	.881[a]	-.091	-.284
	Consumer_is_not_willing_to_adapt_digitalization	-.136	.118	.069	-.169	-.078	.017	.109	-.136	.057	.106	.022	-.402	.135	-.119	.140	-.139	-.098	-.073	-.093	-.091	.824[a]	.074
	Lack_of_Government_incentives	-.040	.092	-.099	-.155	.112	.079	-.017	-.030	-.002	.151	-.056	.012	-.048	.126	-.066	.091	-.137	-.467	-.163	-.294	.074	.796[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

	Initial	Extraction
Lack_of_Empowering_Employees	1.000	.692
Lack_of_Business_Measurement	1.000	.650
Lack_of_Collaborative_Culture	1.000	.743
Lack_of_External_capacity_building	1.000	.665
Absence_of_Digitalization_culture	1.000	.588
Lack_of_Long_Term_Philosophy	1.000	.708
Insufficient_Knowledge	1.000	.636
Lack_To_Exposure_To_International_Market	1.000	.539
Security_Concerns	1.000	.424
Lack_of_Top_Management_Support	1.000	.730
Lack_of_resources	1.000	.678
Resistance_to_change	1.000	.557
Absence_of_skills	1.000	.690
Absence_of_Training	1.000	.626
Absence_of_Agility	1.000	.619
Absence_of_funding	1.000	.674
Burearucracy	1.000	.560
Lack_of_Economic_Stability	1.000	.753
Lack_of_Advanced_internet	1.000	.602
Legal_or_regulations	1.000	.550
Consumer_is_not_willing_to_adapt_digitalization	1.000	.302
Lack_of_Government_incentives	1.000	.737

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.915
Bartlett's Test of Sphericity	Approx. Chi-Square	6129.906
	df	190
	Sig.	.000

Anti-image Matrices

		Lack_of_Empowering_Employees	Lack_of_Business_Measurement	Lack_of_Collaborative_Culture	Lack_of_External_capacity_building	Absence_of_Digitalization_culture	Lack_of_Long_Term_Philosophy	Insufficient_Knowledge	Lack_To_Exposure_To_International_Market	Lack_of_Top_Management_Support	Lack_of_resources	Resistance_to_change	Absence_of_skills	Absence_of_Training	Absence_of_Agility	Absence_of_funding	Bureaucracy	Lack_of_Economic_Stability	Lack_of_Advanced_interest	Legal_or_regulations	Lack_of_Government_incentives
Anti-image Covariance	Lack_of_Empowering_Employees	.331	-.096	-.072	.009	-.006	.010	-.022	-.033	-.030	.003	.024	.005	-.035	.015	.002	-.061	.006	.016	-.076	-.011
	Lack_of_Business_Measurement	-.096	.333	-.004	-.104	.013	-.061	-.049	.013	.052	.015	-.029	.045	-.032	-.085	.013	-.010	.009	-.059	.031	.031
	Lack_of_Collaborative_Culture	-.072	-.004	.253	-.072	-.002	-.047	-.004	.022	-.069	-.001	-.040	.003	.008	-.043	.007	.048	-.021	.040	-.035	-.033
	Lack_of_External_capacity_building	.009	-.104	-.072	.305	-.127	.045	-.014	-.081	-.015	-.046	.036	-.005	-.014	.042	-.004	-.002	.052	.031	-.020	-.050
	Absence_of_Digitalization_culture	-.006	.013	-.002	-.127	.385	-.053	-.025	.057	-.074	.009	.043	-.057	-.018	.030	.036	-.051	.003	-.053	.016	.047
	Lack_of_Long_Term_Philosophy	.010	-.061	-.047	.045	-.053	.287	-.118	-.079	-.037	-.024	.006	-.039	.001	.008	.045	-.013	-.031	-.022	.005	.026
	Insufficient_Knowledge	-.022	-.049	-.004	-.014	-.025	-.118	.398	-.077	-.017	.016	-.036	.030	.032	-.022	-.016	.030	.003	.014	.015	-.011
	Lack_To_Exposure_To_International_Market	-.033	.013	.022	-.081	.057	-.079	-.077	.465	-.032	-.019	-.002	.010	-.073	.005	-.024	.020	.018	-.027	.021	-.009
	Lack_of_Top_Management_Support	-.030	.052	-.069	-.015	-.074	-.037	-.017	-.032	.233	-.044	-.042	.064	.004	-.048	-.057	-.010	-.020	.005	-.051	.044
	Lack_of_resources	.003	.015	-.001	-.046	.009	-.024	.016	-.019	-.044	.350	-.034	-.104	-.035	.048	-.136	-.037	.054	-.032	.026	-.022
	Resistance_to_change	.024	-.029	-.040	.036	.043	.006	-.036	-.002	-.042	-.034	.533	-.094	.026	-.067	-.026	.005	-.040	.007	.018	.021
	Absence_of_skills	.005	.045	.003	-.005	-.057	-.039	.030	.010	.064	-.104	-.094	.364	-.138	-.064	-.069	.015	.035	.001	-.030	-.022
	Absence_of_Training	-.035	-.032	.008	-.014	-.018	.001	.032	-.073	.004	-.035	.026	-.138	.420	-.044	-.008	-.027	-.012	.043	-.014	.055
	Absence_of_Agility	.015	-.085	-.043	.042	.030	.009	-.022	.005	-.048	.049	-.067	-.064	-.044	.280	-.030	-.138	.040	-.047	.073	-.026
	Absence_of_funding	.002	.013	.007	-.004	.036	.045	-.016	-.024	-.057	-.136	-.026	-.069	-.008	-.030	.403	.000	-.099	-.036	.026	.041
	Bureaucracy	-.061	-.010	.048	-.002	-.051	-.013	.030	.020	-.010	-.037	.005	.015	-.027	-.136	.000	.368	-.071	.067	-.074	-.051
	Lack_of_Economic_Stability	.006	.009	-.021	.052	.003	-.031	.003	.018	-.020	.054	-.040	.035	-.012	.040	-.099	-.071	.364	-.152	.023	-.176
	Lack_of_Advanced_interest	.016	-.059	.040	.031	-.053	-.022	.014	-.027	.005	-.032	.007	.001	.043	-.047	-.036	.067	-.152	.499	-.120	-.070
	Legal_or_regulations	-.076	.031	-.035	-.020	.016	.005	.015	.021	-.051	.026	.018	-.030	-.014	.073	.026	-.074	.023	-.120	.511	-.130
	Lack_of_Government_incentives	-.011	.031	-.033	-.050	.047	.026	-.011	-.009	.044	-.022	.021	-.022	.055	-.026	.041	-.051	-.176	-.070	-.130	.395
Anti-image Correlation	Lack_of_Empowering_Employees	.953[a]	-.290	-.249	.026	-.017	.034	-.062	-.085	-.108	.009	.057	.014	-.094	.050	.007	-.174	.016	.039	-.186	-.031
	Lack_of_Business_Measurement	-.290	.912[a]	-.012	-.328	.036	-.197	-.134	.034	.187	.044	-.069	.128	-.085	-.278	.035	-.029	.025	-.145	.075	.084
	Lack_of_Collaborative_Culture	-.249	-.012	.943[a]	-.258	-.008	-.173	-.012	.063	-.285	-.005	-.108	.010	.025	-.163	.022	.158	-.069	.111	-.098	-.105
	Lack_of_External_capacity_building	.026	-.328	-.258	.902[a]	-.371	.153	-.040	-.214	-.055	-.140	.090	-.014	-.038	.143	-.010	-.007	.155	.080	-.051	-.145
	Absence_of_Digitalization_culture	-.017	.036	-.008	-.371	.922[a]	-.160	-.064	.134	-.248	.026	.094	-.152	-.045	.092	.092	-.136	.007	-.121	.036	.120
	Lack_of_Long_Term_Philosophy	.034	-.197	-.173	.153	-.160	.935[a]	-.350	-.216	-.144	-.077	.016	-.120	.001	.028	.133	-.041	-.095	-.058	.013	.078
	Insufficient_Knowledge	-.062	-.134	-.012	-.040	-.064	-.350	.949[a]	-.180	-.055	.042	-.079	.080	.078	-.067	-.041	.078	.008	.032	.032	-.027
	Lack_To_Exposure_To_International_Market	-.085	.034	.063	-.214	.134	-.216	-.180	.950[a]	-.096	-.046	-.005	.024	-.166	.015	-.055	.048	.043	-.057	.043	-.020
	Lack_of_Top_Management_Support	-.108	.187	-.285	-.055	-.248	-.144	-.055	-.096	.932[a]	-.153	-.120	.221	.014	-.188	-.185	-.034	-.067	.016	-.147	.144
	Lack_of_resources	.009	.044	-.005	-.140	.026	-.077	.042	-.046	-.153	.922[a]	-.078	-.291	-.092	.154	-.362	-.103	.153	-.077	.061	-.059
	Resistance_to_change	.057	-.069	-.108	.090	.094	.016	-.079	-.005	-.120	-.078	.953[a]	-.212	.054	-.174	-.056	.012	-.090	.014	.035	.045
	Absence_of_skills	.014	.128	.010	-.014	-.152	-.120	.080	.024	.221	-.291	-.212	.883[a]	-.354	-.200	-.181	.042	.097	.002	-.070	-.058
	Absence_of_Training	-.094	-.085	.025	-.038	-.045	.001	.078	-.166	.014	-.092	.054	-.354	.940[a]	-.129	-.019	-.068	-.031	.093	-.031	.136
	Absence_of_Agility	.050	-.278	-.163	.143	.092	.028	-.067	.015	-.188	.154	-.174	-.200	-.129	.899[a]	-.088	-.431	.125	-.125	.192	-.077
	Absence_of_funding	.007	.035	.022	-.010	.092	.133	-.041	-.055	-.185	-.362	-.056	-.181	-.019	-.088	.918[a]	-.001	-.258	-.080	.057	.103
	Bureaucracy	-.174	-.029	.158	-.007	-.136	-.041	.078	.048	-.034	-.103	.012	.042	-.068	-.431	-.001	.911[a]	-.195	.203	-.171	-.133
	Lack_of_Economic_Stability	.016	.025	-.069	.155	.007	-.095	.008	.043	-.067	.153	-.090	.097	-.031	.125	-.258	-.195	.781[a]	-.356	.053	-.464
	Lack_of_Advanced_interest	.039	-.145	.111	.080	-.121	-.059	.032	-.057	.016	-.077	.014	.002	.093	-.125	-.080	.203	-.356	.841[a]	-.238	-.158
	Legal_or_regulations	-.186	.075	-.098	-.051	.036	.013	.032	.043	-.147	.061	.035	-.070	-.031	.192	.057	-.171	.053	-.238	.886[a]	-.289
	Lack_of_Government_incentives	-.031	.084	-.105	-.145	.120	.078	-.027	-.020	.144	-.059	.045	-.058	.136	-.077	.103	-.133	-.464	-.158	-.289	.792[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

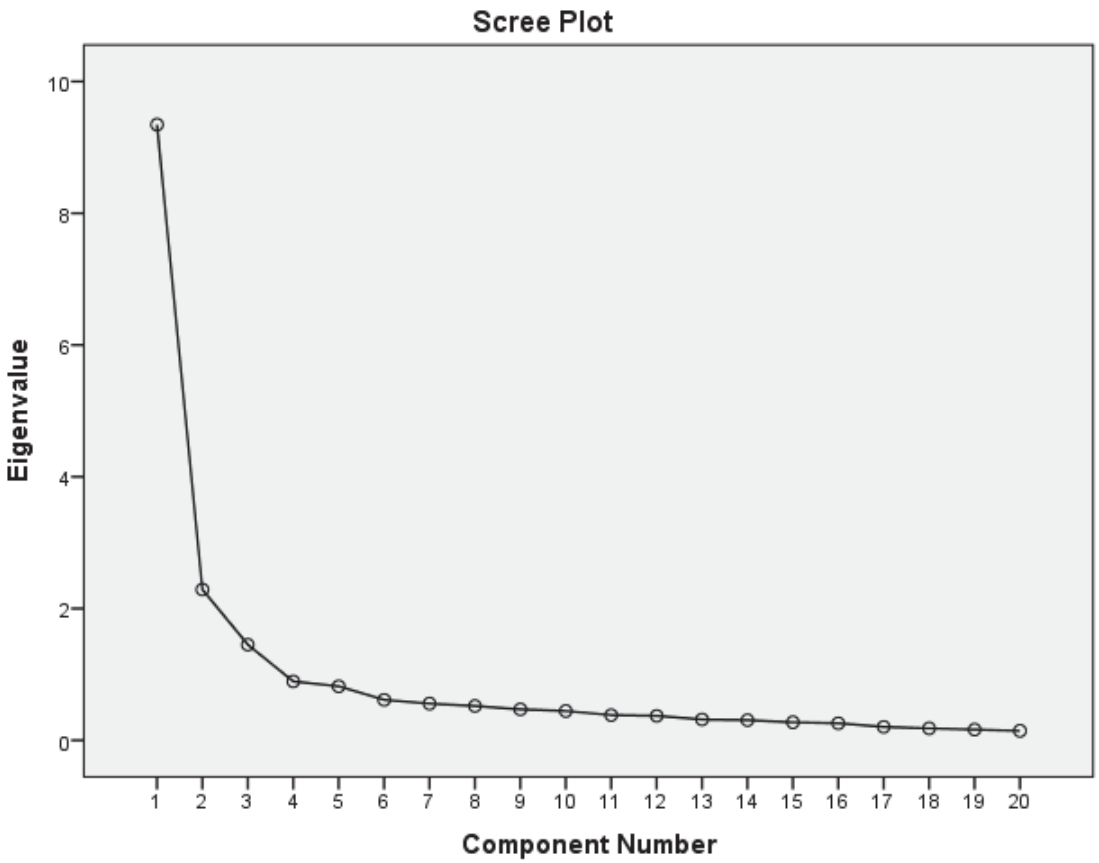
	Initial	Extraction
Lack_of_Empowering_Employees	1.000	.694
Lack_of_Business_Measurement	1.000	.644
Lack_of_Collaborative_Culture	1.000	.747
Lack_of_External_capacity_building	1.000	.677
Absence_of_Digitalization_culture	1.000	.596
Lack_of_Long_Term_Philosophy	1.000	.707
Insufficient_Knowledge	1.000	.627
Lack_To_Exposure_To_International_Market	1.000	.541
Lack_of_Top_Management_Support	1.000	.732
Lack_of_resources	1.000	.687
Resistance_to_change	1.000	.521
Absence_of_skills	1.000	.733
Absence_of_Training	1.000	.633
Absence_of_Agility	1.000	.640
Absence_of_funding	1.000	.687
Burearucracy	1.000	.562
Lack_of_Economic_Stability	1.000	.757
Lack_of_Advanced_internet	1.000	.605
Legal_or_regulations	1.000	.551
Lack_of_Government_incentives	1.000	.744

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.345	46.726	46.726	9.345	46.726	46.726
2	2.288	11.438	58.164	2.288	11.438	58.164
3	1.451	7.253	65.417	1.451	7.253	65.417
4	.894	4.471	69.888			
5	.820	4.098	73.986			
6	.614	3.070	77.056			
7	.557	2.785	79.841			
8	.521	2.605	82.446			
9	.470	2.348	84.794			
10	.445	2.224	87.018			
11	.382	1.911	88.928			
12	.371	1.857	90.785			
13	.316	1.582	92.367			
14	.305	1.526	93.893			
15	.273	1.366	95.260			
16	.258	1.291	96.551			
17	.204	1.018	97.568			
18	.182	.908	98.476			
19	.161	.807	99.283			
20	.143	.717	100.000			

Extraction Method: Principal Component Analysis.


Scree Plot
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Component Number

Component Matrix[a]

	Component		
	1	2	3
Lack_of_Empowering_Employees	.792		
Lack_of_Business_Measurement	.738		
Lack_of_Collaborative_Culture	.839		
Lack_of_External_capacity_building	.738		
Absence_of_Digitalization_culture	.710		
Lack_of_Long_Term_Philosophy	.807		
Insufficient_Knowledge	.712		
Lack_To_Exposure_To_International_Market	.698		
Lack_of_Top_Management_Support	.850		
Lack_of_resources	.715		.384
Resistance_to_change	.627		.356
Absence_of_skills	.642		.530
Absence_of_Training	.673		
Absence_of_Agility	.781		
Absence_of_funding	.660		.498
Burearucracy	.723		
Lack_of_Economic_Stability	.402	.766	
Lack_of_Advanced_internet	.419	.653	
Legal_or_regulations	.491	.526	
Lack_of_Government_incentives	.371	.778	

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
Lack_of_Empowering_Employees	.747		
Lack_of_Business_Measurement	.764		
Lack_of_Collaborative_Culture	.760		
Lack_of_External_capacity_building	.789		
Absence_of_Digitalization_culture	.727		
Lack_of_Long_Term_Philosophy	.764		
Insufficient_Knowledge	.765		
Lack_To_Exposure_To_International_Market	.656		
Lack_of_Top_Management_Support	.706	.417	
Lack_of_resources	.358	.743	
Resistance_to_change		.646	
Absence_of_skills		.826	
Absence_of_Training	.428	.666	
Absence_of_Agility	.499	.583	
Absence_of_funding		.761	
Burearucracy	.445	.445	.408
Lack_of_Economic_Stability			.855
Lack_of_Advanced_internet			.755
Legal_or_regulations			.662
Lack_of_Government_incentives			.858

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Structure Matrix

	Component		
	1	2	3
Lack_of_Empowering_Employees	.817	.394	.492
Lack_of_Business_Measurement	.802		.461
Lack_of_Collaborative_Culture	.849	.396	.560
Lack_of_External_capacity_building	.818		.467
Absence_of_Digitalization_culture	.769		.473
Lack_of_Long_Term_Philosophy	.837		.552
Insufficient_Knowledge	.789		.416
Lack_To_Exposure_To_International_Market	.724		.522
Lack_of_Top_Management_Support	.826	.370	.644
Lack_of_resources	.568		.822
Resistance_to_change	.472		.715
Absence_of_skills	.458		.851
Absence_of_Training	.589		.752
Absence_of_Agility	.676		.733
Absence_of_funding	.440	.363	.808
Burearucracy	.612	.503	.608
Lack_of_Economic_Stability		.864	
Lack_of_Advanced_internet		.774	
Legal_or_regulations	.423	.698	
Lack_of_Government_incentives		.861	

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Rotated Component Matrix[a]

	Component		
	1	2	3
Lack_of_Empowering_Employees	.808		
Lack_of_Business_Measurement	.797		
Lack_of_Collaborative_Culture	.846		
Lack_of_External_capacity_building	.815		
Absence_of_Digitalization_culture	.769		
Lack_of_Long_Term_Philosophy	.838		
Insufficient_Knowledge	.779		
Lack_To_Exposure_To_International_Market	.733		
Lack_of_Top_Management_Support	.836		
Lack_of_resources	.626		.542
Resistance_to_change	.521		.485
Absence_of_skills	.530		.671
Absence_of_Training	.642		.447
Absence_of_Agility	.710		
Absence_of_funding	.499		.623
Burearucracy	.628		
Lack_of_Economic_Stability		.840	
Lack_of_Advanced_internet		.733	
Legal_or_regulations	.395	.618	
Lack_of_Government_incentives		.841	

Extraction Method: Principal Component Analysis.
Rotation Method: Quartimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

Rotated Component Matrix[a]

	Component		
	1	2	3
Lack_of_Empowering_Employees	.725		
Lack_of_Business_Measurement	.748		
Lack_of_Collaborative_Culture	.734		
Lack_of_External_capacity_building	.775		
Absence_of_Digitalization_culture	.712		
Lack_of_Long_Term_Philosophy	.742		
Insufficient_Knowledge	.751		
Lack_To_Exposure_To_International_Market	.637	.361	
Lack_of_Top_Management_Support	.676	.448	
Lack_of_resources		.759	
Resistance_to_change		.656	
Absence_of_skills		.835	
Absence_of_Training	.396	.688	
Absence_of_Agility	.461	.604	
Absence_of_funding		.765	
Burearucracy	.408	.460	.429
Lack_of_Economic_Stability			.858
Lack_of_Advanced_internet			.761
Legal_or_regulations			.673
Lack_of_Government_incentives			.860

Extraction Method: Principal Component Analysis.
Rotation Method: Equamax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Structure Matrix

	Component		
	1	2	3
Lack_of_Empowering_Employees	.822	.530	.441
Lack_of_Business_Measurement	.801	.494	
Lack_of_Collaborative_Culture	.855	.597	.447
Lack_of_External_capacity_building	.814	.499	
Absence_of_Digitalization_culture	.767	.502	
Lack_of_Long_Term_Philosophy	.840	.585	
Insufficient_Knowledge	.786	.450	
Lack_To_Exposure_To_International_Market	.725	.546	
Lack_of_Top_Management_Support	.835	.674	.424
Lack_of_resources	.587	.825	
Resistance_to_change	.493	.719	
Absence_of_skills	.480	.844	
Absence_of_Training	.599	.755	
Absence_of_Agility	.693	.750	.394
Absence_of_funding	.468	.809	.406
Burearucracy	.631	.631	.542
Lack_of_Economic_Stability			.862
Lack_of_Advanced_internet			.776
Legal_or_regulations	.440		.708
Lack_of_Government_incentives			.855

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.

Rotated Component Matrix[a]

	Component		
	1	2	3
Lack_of_Empowering_Employees	.747		
Lack_of_Business_Measurement	.764		
Lack_of_Collaborative_Culture	.760		
Lack_of_External_capacity_building	.789		
Absence_of_Digitalization_culture	.727		
Lack_of_Long_Term_Philosophy	.764		
Insufficient_Knowledge	.765		
Lack_To_Exposure_To_International_Market	.656		
Lack_of_Top_Management_Support	.706	.417	
Lack_of_resources	.358	.743	
Resistance_to_change		.646	
Absence_of_skills		.826	
Absence_of_Training	.428	.666	
Absence_of_Agility	.499	.583	
Absence_of_funding		.761	
Burearucracy	.445	.445	.408
Lack_of_Economic_Stability			.855
Lack_of_Advanced_internet			.755
Legal_or_regulations			.662
Lack_of_Government_incentives			.858

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.870
Bartlett's Test of Sphericity	Approx. Chi-Square	3319.661
	df	91
	Sig.	.000

Anti-image Matrices

		Lack_of_Empowering_Employees	Lack_of_Business_Measurement	Lack_of_External_capacity_building	Absence_of_Digitalization_culture	Lack_of_Long_Term_Philosophy	Insufficient_Knowledge	Lack_To_Exposure_To_International_Market	Resistance_to_change	Absence_of_skills	Absence_of_funding	Lack_of_Economic_Stability	Lack_of_Advanced_internet	Legal_or_regulations	Lack_of_Government_incentives
Anti-image Covariance	Lack_of_Empowering_Employees	.385	-.137	-.024	-.044	-.023	-.026	-.047	-.012	-.003	-.032	-.018	.055	-.134	-.024
	Lack_of_Business_Measurement	-.137	.390	-.112	.031	-.067	-.057	.020	-.056	.007	.030	.011	-.069	.064	.017
	Lack_of_External_capacity_building	-.024	-.112	.349	-.175	.026	-.016	-.102	.026	-.011	-.042	.061	.050	-.049	-.061
	Absence_of_Digitalization_culture	-.044	.031	-.175	.424	-.089	-.029	.053	.026	-.071	.013	-.017	-.041	-.017	.062
	Lack_of_Long_Term_Philosophy	-.023	-.067	.026	-.089	.315	-.137	-.095	-.029	-.056	.022	-.043	-.014	-.017	.029
	Insufficient_Knowledge	-.026	-.057	-.016	-.029	-.137	.407	-.078	-.055	.071	-.019	.006	.007	.019	-.011
	Lack_To_Exposure_To_International_Market	-.047	.020	-.102	.053	-.095	-.078	.486	-.005	-.024	-.059	.022	-.029	.019	.009
	Resistance_to_change	-.012	-.056	.026	.026	-.028	-.055	-.005	.597	-.161	-.100	-.048	.011	.013	.010
	Absence_of_skills	-.003	.007	-.011	-.071	-.056	.071	-.024	-.161	.524	-.200	.082	.004	-.011	-.039
	Absence_of_funding	-.032	.030	-.042	.013	.022	-.019	-.059	-.100	-.200	.513	-.118	-.053	.024	.054
	Lack_of_Economic_Stability	-.018	.011	.061	-.017	-.043	.006	.022	-.048	.082	-.118	.388	-.146	-.001	-.205
	Lack_of_Advanced_internet	.055	-.069	.050	-.041	-.014	.007	-.029	.011	.004	-.053	-.146	.532	-.107	-.074
	Legal_or_regulations	-.134	.064	-.049	-.017	-.017	.019	.019	.013	-.011	.024	-.001	-.107	.552	-.148
	Lack_of_Government_incentives	-.024	.017	-.061	.062	.029	-.011	.009	.010	-.039	.054	-.205	-.074	-.148	.424
Anti-image Correlation	Lack_of_Empowering_Employees	.917[a]	-.355	-.065	-.108	-.067	-.066	-.108	-.025	-.006	-.071	-.045	.121	-.290	-.060
	Lack_of_Business_Measurement	-.355	.887[a]	-.305	.077	-.191	-.142	.045	-.116	.015	.068	.029	-.152	.138	.042
	Lack_of_External_capacity_building	-.065	-.305	.854[a]	-.455	.078	-.042	-.249	.059	-.025	-.100	.166	.116	-.112	-.160
	Absence_of_Digitalization_culture	-.108	.077	-.455	.871[a]	-.243	-.069	.116	.052	-.152	.028	-.043	-.086	-.034	.146
	Lack_of_Long_Term_Philosophy	-.067	-.191	.078	-.243	.900[a]	-.383	-.243	-.065	-.139	.055	-.122	-.034	-.040	.077
	Insufficient_Knowledge	-.066	-.142	-.042	-.069	-.383	.915[a]	-.175	-.112	.154	-.042	.015	.015	.040	-.026
	Lack_To_Exposure_To_International_Market	-.108	.045	-.249	.116	-.243	-.175	.923[a]	-.009	-.047	-.119	.051	-.058	.037	.020
	Resistance_to_change	-.025	-.116	.059	.052	-.065	-.112	-.009	.913[a]	-.288	-.181	-.100	.019	.024	.020
	Absence_of_skills	-.006	.015	-.025	-.152	-.139	.154	-.047	-.288	.937[a]	-.386	.181	.009	-.020	-.084
	Absence_of_funding	-.071	.068	-.100	.028	.055	-.042	-.119	-.181	-.386	.858[a]	-.264	-.102	.045	.115
	Lack_of_Economic_Stability	-.045	.029	.166	-.043	-.122	.015	.051	-.100	.181	-.264	.742[a]	-.320	-.003	-.506
	Lack_of_Advanced_internet	.121	-.152	.116	-.086	-.034	.015	-.056	.019	.009	-.102	-.320	.859[a]	-.198	-.155
	Legal_or_regulations	-.290	.138	-.112	-.034	-.040	.040	.037	.024	-.020	.045	-.003	-.198	.855[a]	-.305
	Lack_of_Government_incentives	-.060	.042	-.160	.146	.077	-.026	.020	.020	-.084	.115	-.506	-.155	-.305	.753[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

	Initial	Extraction
Lack_of_Empowering_Employees	1.000	.683
Lack_of_Business_Measurement	1.000	.662
Lack_of_External_capacity_building	1.000	.698
Absence_of_Digitalization_culture	1.000	.605
Lack_of_Long_Term_Philosophy	1.000	.717
Insufficient_Knowledge	1.000	.635
Lack_To_Exposure_To_International_Market	1.000	.573
Resistance_to_change	1.000	.640
Absence_of_skills	1.000	.683
Absence_of_funding	1.000	.715
Lack_of_Economic_Stability	1.000	.758
Lack_of_Advanced_internet	1.000	.637
Legal_or_regulations	1.000	.591
Lack_of_Government_incentives	1.000	.752

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.015	42.962	42.962	6.015	42.962	42.962	4.444	31.741	31.741
2	2.154	15.382	58.344	2.154	15.382	58.344	2.742	19.586	51.327
3	1.182	8.446	66.790	1.182	8.446	66.790	2.165	15.463	66.790
4	.784	5.598	72.389						
5	.591	4.223	76.612						
6	.541	3.861	80.473						
7	.480	3.426	83.899						
8	.449	3.205	87.104						
9	.416	2.974	90.078						
10	.389	2.778	92.856						
11	.329	2.351	95.207						
12	.263	1.879	97.086						
13	.213	1.522	98.608						
14	.195	1.392	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component		
	1	2	3
Lack_of_Empowering_Employees	.756		
Lack_of_Business_Measurement	.787		
Lack_of_External_capacity_building	.821		
Absence_of_Digitalization_culture	.752		
Lack_of_Long_Term_Philosophy	.771		
Insufficient_Knowledge	.763		
Lack_To_Exposure_To_International_Market	.688		
Resistance_to_change			.740
Absence_of_skills			.765
Absence_of_funding			.775
Lack_of_Economic_Stability		.842	
Lack_of_Advanced_internet		.766	
Legal_or_regulations		.689	
Lack_of_Government_incentives		.863	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.955[a]	.912	.910	.29930198

a. Predictors: (Constant), Lack_To_Exposure_To_International_Market, Absence_of_Digitalization_culture, Lack_of_Business_Measurement, Insufficient_Knowledge, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Collaborative_Culture, Lack_of_Long_Term_Philosophy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	401.301	8	50.163	559.965	.000[b]
	Residual	38.699	432	.090		
	Total	440.000	440			

a. Dependent Variable: REGR factor score 1 for analysis 1

b. Predictors: (Constant), Lack_To_Exposure_To_International_Market, Absence_of_Digitalization_culture, Lack_of_Business_Measurement, Insufficient_Knowledge, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Collaborative_Culture, Lack_of_Long_Term_Philosophy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.456	.040		-60.767	.000
	Lack_of_Empowering_Employees	.059	.008	.161	7.041	.000
	Lack_of_Business_Measurement	.064	.008	.177	7.976	.000
	Lack_of_Collaborative_Culture	.012	.009	.035	1.413	.158
	Lack_of_External_capacity_building	.112	.010	.281	11.649	.000
	Absence_of_Digitalization_culture	.062	.008	.171	7.964	.000
	Lack_of_Long_Term_Philosophy	.031	.009	.090	3.505	.001
	Insufficient_Knowledge	.062	.007	.186	8.420	.000
	Lack_To_Exposure_To_International_Market	.029	.007	.077	3.842	.000

a. Dependent Variable: REGR factor score 1 for analysis 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.955[a]	.912	.910	.29964660

a. Predictors: (Constant), Lack_To_Exposure_To_International_Market, Absence_of_Digitalization_culture, Lack_of_Business_Measurement, Insufficient_Knowledge, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Long_Term_Philosophy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	401.122	7	57.303	638.204	.000[b]
	Residual	38.878	433	.090		
	Total	440.000	440			

a. Dependent Variable: REGR factor score 1 for analysis 1

b. Predictors: (Constant), Lack_To_Exposure_To_International_Market, Absence_of_Digitalization_culture, Lack_of_Business_Measurement, Insufficient_Knowledge, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Long_Term_Philosophy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.458	.040		-60.779	.000
	Lack_of_Empowering_Employees	.063	.008	.174	8.191	.000
	Lack_of_Business_Measurement	.064	.008	.177	7.952	.000
	Lack_of_External_capacity_building	.116	.009	.291	12.537	.000
	Absence_of_Digitalization_culture	.063	.008	.172	8.029	.000
	Lack_of_Long_Term_Philosophy	.035	.009	.099	4.026	.000
	Insufficient_Knowledge	.063	.007	.188	8.527	.000
	Lack_To_Exposure_To_International_Market	.028	.007	.076	3.802	.000

a. Dependent Variable: REGR factor score 1 for analysis 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.295[a]	.087	.080	.95891310

a. Predictors: (Constant), Absence_of_funding, Resistance_to_change, Absence_of_skills

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38.172	3	12.724	13.838	.000[b]
	Residual	401.828	437	.920		
	Total	440.000	440			

a. Dependent Variable: REGR factor score 2 for analysis 1

b. Predictors: (Constant), Absence_of_funding, Resistance_to_change, Absence_of_skills

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.393	.148		-2.659	.008
	Resistance_to_change	.023	.019	.068	1.219	.223
	Absence_of_skills	-.085	.024	-.205	-3.490	.001
	Absence_of_funding	.121	.021	.330	5.678	.000

a. Dependent Variable: REGR factor score 2 for analysis 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.289[a]	.084	.079	.95944576

a. Predictors: (Constant), Absence_of_funding, Absence_of_skills

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	36.805	2	18.403	19.991	.000[b]
	Residual	403.195	438	.921		
	Total	440.000	440			

a. Dependent Variable: REGR factor score 2 for analysis 1

b. Predictors: (Constant), Absence_of_funding, Absence_of_skills

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.356	.145		-2.459	.014
	Absence_of_skills	-.075	.023	-.182	-3.270	.001
	Absence_of_funding	.128	.020	.351	6.312	.000

a. Dependent Variable: REGR factor score 2 for analysis 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.321[a]	.103	.095	.95133743

a. Predictors: (Constant), Lack_of_Government_incentives, Lack_of_Advanced_internet, Legal_or_regulations, Lack_of_Economic_Stability

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.401	4	11.350	12.541	.000[b]
	Residual	394.599	436	.905		
	Total	440.000	440			

a. Dependent Variable: REGR factor score 3 for analysis 1

b. Predictors: (Constant), Lack_of_Government_incentives, Lack_of_Advanced_internet, Legal_or_regulations, Lack_of_Economic_Stability

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.523	.139		-3.750	.000
	Lack_of_Economic_Stability	.107	.024	.305	4.518	.000
	Lack_of_Advanced_internet	.063	.022	.176	2.922	.004
	Legal_or_regulations	-.055	.020	-.151	-2.719	.007
	Lack_of_Government_incentives	-.061	.022	-.188	-2.786	.006

a. Dependent Variable: REGR factor score 3 for analysis 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.447[a]	.200	.176	2.377

a. Predictors: (Constant), Absence_of_funding, Lack_of_Government_incentives, Lack_of_Business_Measurement, Absence_of_Digitalization_culture, Lack_of_Advanced_internet, Lack_To_Exposure_To_International_Market, Legal_or_regulations, Absence_of_skills, Insufficient_Knowledge, Lack_of_Economic_Stability, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Long_Term_Philosophy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	599.795	13	46.138	8.165	.000[b]
	Residual	2395.758	424	5.650		
	Total	2995.553	437			

a. Dependent Variable: Readiness

b. Predictors: (Constant), Absence_of_funding, Lack_of_Government_incentives, Lack_of_Business_Measurement, Absence_of_Digitalization_culture, Lack_of_Advanced_internet, Lack_To_Exposure_To_International_Market, Legal_or_regulations, Absence_of_skills, Insufficient_Knowledge, Lack_of_Economic_Stability, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Long_Term_Philosophy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.137	.470		17.318	.000
	Lack_of_Economic_Stability	.035	.064	.039	.554	.580
	Lack_of_Advanced_internet	.014	.056	.014	.242	.809
	Legal_or_regulations	.186	.055	.197	3.369	.001
	Lack_of_Government_incentives	.027	.057	.032	.476	.635
	Lack_of_Empowering_Employees	.030	.067	.032	.454	.650
	Lack_of_Business_Measurement	-.102	.065	-.109	-1.569	.117
	Lack_of_External_capacity_building	-.174	.076	-.167	-2.279	.023
	Absence_of_Digitalization_culture	.180	.064	.188	2.820	.005
	Lack_of_Long_Term_Philosophy	-.091	.070	-.100	-1.294	.196
	Insufficient_Knowledge	-.029	.060	-.033	-.483	.629
	Lack_To_Exposure_To_International_Market	-.066	.060	-.068	-1.092	.275
	Absence_of_skills	-.366	.062	-.338	-5.885	.000
	Absence_of_funding	.170	.057	.177	2.969	.003

a. Dependent Variable: Readiness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.443[a]	.196	.181	2.369

a. Predictors: (Constant), Absence_of_funding, Legal_or_regulations, Lack_of_Business_Measurement, Absence_of_Digitalization_culture, Lack_To_Exposure_To_International_Market, Absence_of_skills, Lack_of_Long_Term_Philosophy, Lack_of_External_capacity_building

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	587.040	8	73.380	13.070	.000[b]
	Residual	2408.512	429	5.614		
	Total	2995.553	437			

a. Dependent Variable: Readiness

b. Predictors: (Constant), Absence_of_funding, Legal_or_regulations, Lack_of_Business_Measurement, Absence_of_Digitalization_culture, Lack_To_Exposure_To_International_Market, Absence_of_skills, Lack_of_Long_Term_Philosophy, Lack_of_External_capacity_building

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.393	.405		20.702	.000
	Legal_or_regulations	.230	.044	.243	5.195	.000
	Lack_of_Business_Measurement	-.093	.059	-.098	-1.573	.117
	Lack_of_External_capacity_building	-.185	.073	-.177	-2.517	.012
	Absence_of_Digitalization_culture	.177	.062	.184	2.836	.005
	Lack_of_Long_Term_Philosophy	-.092	.063	-.101	-1.451	.147
	Lack_To_Exposure_To_International_Market	-.071	.059	-.073	-1.212	.226
	Absence_of_skills	-.372	.060	-.343	-6.145	.000
	Absence_of_funding	.192	.053	.200	3.651	.000

a. Dependent Variable: Readiness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.414[a]	.172	.162	2.396

a. Predictors: (Constant), Absence_of_funding, Legal_or_regulations, Absence_of_Digitalization_culture, Absence_of_skills, Lack_of_External_capacity_building

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	514.656	5	102.931	17.923	.000[b]
	Residual	2480.896	432	5.743		
	Total	2995.553	437			

a. Dependent Variable: Readiness

b. Predictors: (Constant), Absence_of_funding, Legal_or_regulations, Absence_of_Digitalization_culture, Absence_of_skills, Lack_of_External_capacity_building

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.396	.403		20.824	.000
	Legal_or_regulations	.219	.044	.232	4.922	.000
	Lack_of_External_capacity_building	-.288	.065	-.276	-4.437	.000
	Absence_of_Digitalization_culture	.127	.059	.132	2.136	.033
	Absence_of_skills	-.398	.061	-.367	-6.564	.000
	Absence_of_funding	.159	.052	.166	3.059	.002

a. Dependent Variable: Readiness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.333[a]	.111	.105	2.477

a. Predictors: (Constant), REGR factor score 3 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 1 for analysis 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	332.317	3	110.772	18.051	.000[b]
	Residual	2663.236	434	6.136		
	Total	2995.553	437			

a. Dependent Variable: Readiness

b. Predictors: (Constant), REGR factor score 3 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 1 for analysis 1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.036	.118		59.443	.000
	REGR factor score 1 for analysis 1	-.485	.118	-.185	-4.098	.000
	REGR factor score 2 for analysis 1	.579	.118	.222	4.900	.000
	REGR factor score 3 for analysis 1	-.433	.118	-.166	-3.664	.000

a. Dependent Variable: Readiness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.431[a]	.186	.161	2.154

a. Predictors: (Constant), Lack_of_Government_incentives, Absence_of_Digitalization_culture, Absence_of_funding, Lack_To_Exposure_To_International_Market, Lack_of_Advanced_internet, Lack_of_Business_Measurement, Legal_or_regulations, Absence_of_skills, Insufficient_Knowledge, Lack_of_Economic_Stability, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Long_Term_Philosophy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	452.635	13	34.818	7.504	.000[b]
	Residual	1981.274	427	4.640		
	Total	2433.909	440			

a. Dependent Variable: Awareness_about_the_benefits

b. Predictors: (Constant), Lack_of_Government_incentives, Absence_of_Digitalization_culture, Absence_of_funding, Lack_To_Exposure_To_International_Market, Lack_of_Advanced_internet, Lack_of_Business_Measurement, Legal_or_regulations, Absence_of_skills, Insufficient_Knowledge, Lack_of_Economic_Stability, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Long_Term_Philosophy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.898	.424		21.007	.000
	Lack_of_Empowering_Employees	.040	.060	.047	.668	.504
	Lack_of_Business_Measurement	.057	.059	.068	.974	.331
	Lack_of_External_capacity_building	-.068	.069	-.073	-.986	.325
	Absence_of_Digitalization_culture	.045	.058	.053	.786	.432
	Lack_of_Long_Term_Philosophy	.017	.064	.020	.261	.794
	Insufficient_Knowledge	-.202	.054	-.255	-3.749	.000
	Lack_To_Exposure_To_International_Market	-.243	.055	-.278	-4.436	.000
	Absence_of_skills	-.049	.056	-.050	-.865	.388
	Absence_of_funding	.030	.052	.035	.582	.561
	Lack_of_Economic_Stability	.066	.057	.080	1.141	.255
	Lack_of_Advanced_internet	-.029	.050	-.035	-.578	.564
	Legal_or_regulations	-.007	.050	-.008	-.136	.892
	Lack_of_Government_incentives	.085	.051	.111	1.653	.099

a. Dependent Variable: Awareness_about_the_benefits

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.416[a]	.173	.168	2.146

a. Predictors: (Constant), Lack_of_Government_incentives, Lack_To_Exposure_To_International_Market, Insufficient_Knowledge

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	422.084	3	140.695	30.561	.000[b]
	Residual	2011.825	437	4.604		
	Total	2433.909	440			

a. Dependent Variable: Awareness_about_the_benefits

b. Predictors: (Constant), Lack_of_Government_incentives, Lack_To_Exposure_To_International_Market, Insufficient_Knowledge

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.986	.307		29.308	.000
	Insufficient_Knowledge	-.154	.043	-.194	-3.600	.000
	Lack_To_Exposure_To_International_Market	-.234	.047	-.267	-4.968	.000
	Lack_of_Government_incentives	.117	.034	.153	3.480	.001

a. Dependent Variable: Awareness_about_the_benefits

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.337[a]	.113	.107	2.222

a. Predictors: (Constant), REGR factor score 2 for analysis 1, REGR factor score 3 for analysis 1, REGR factor score 1 for analysis 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	275.778	3	91.926	18.614	.000[b]
	Residual	2158.131	437	4.939		
	Total	2433.909	440			

a. Dependent Variable: Awareness_about_the_benefits

b. Predictors: (Constant), REGR factor score 2 for analysis 1, REGR factor score 3 for analysis 1, REGR factor score 1 for analysis 1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.702	.106		72.778	.000
	REGR factor score 1 for analysis 1	-.687	.106	-.292	-6.480	.000
	REGR factor score 3 for analysis 1	-.269	.106	-.115	-2.543	.011
	REGR factor score 2 for analysis 1	.288	.106	.122	2.717	.007

a. Dependent Variable: Awareness_about_the_benefits

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.401[a]	.161	.135	2.221

a. Predictors: (Constant), Lack_of_Government_incentives, Absence_of_Digitalization_culture, Absence_of_funding, Lack_To_Exposure_To_International_Market, Lack_of_Advanced_internet, Lack_of_Business_Measurement, Legal_or_regulations, Absence_of_skills, Insufficient_Knowledge, Lack_of_Economic_Stability, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Long_Term_Philosophy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	403.881	13	31.068	6.300	.000[b]
	Residual	2105.541	427	4.931		
	Total	2509.421	440			

a. Dependent Variable: Awareness

b. Predictors: (Constant), Lack_of_Government_incentives, Absence_of_Digitalization_culture, Absence_of_funding, Lack_To_Exposure_To_International_Market, Lack_of_Advanced_internet, Lack_of_Business_Measurement, Legal_or_regulations, Absence_of_skills, Insufficient_Knowledge, Lack_of_Economic_Stability, Lack_of_Empowering_Employees, Lack_of_External_capacity_building, Lack_of_Long_Term_Philosophy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.857	.437		22.575	.000
	Lack_of_Empowering_Employees	.022	.062	.026	.360	.719
	Lack_of_Business_Measurement	.053	.061	.062	.878	.380
	Lack_of_External_capacity_building	-.065	.071	-.068	-.907	.365
	Absence_of_Digitalization_culture	.045	.059	.052	.765	.445
	Lack_of_Long_Term_Philosophy	-.066	.066	-.079	-1.001	.317
	Insufficient_Knowledge	-.129	.055	-.160	-2.320	.021
	Lack_To_Exposure_To_International_Market	-.222	.056	-.250	-3.928	.000
	Absence_of_skills	-.041	.058	-.041	-.703	.483
	Absence_of_funding	-.001	.053	-.001	-.018	.985
	Lack_of_Economic_Stability	.047	.059	.057	.800	.424
	Lack_of_Advanced_internet	.012	.052	.014	.231	.817
	Legal_or_regulations	.008	.052	.010	.160	.873
	Lack_of_Government_incentives	.002	.053	.003	.046	.964

a. Dependent Variable: Awareness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.387[a]	.150	.146	2.207

a. Predictors: (Constant), Lack_To_Exposure_To_International_Market, Insufficient_Knowledge

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	376.352	2	188.176	38.640	.000[b]
	Residual	2133.069	438	4.870		
	Total	2509.421	440			

a. Dependent Variable: Awareness

b. Predictors: (Constant), Lack_To_Exposure_To_International_Market, Insufficient_Knowledge

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.143	.248		40.892	.000
	Insufficient_Knowledge	-.125	.044	-.156	-2.861	.004
	Lack_To_Exposure_To_International_Market	-.244	.048	-.275	-5.047	.000

a. Dependent Variable: Awareness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.340[a]	.115	.109	2.254

a. Predictors: (Constant), REGR factor score 3 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 1 for analysis 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	289.561	3	96.520	19.001	.000[b]
	Residual	2219.861	437	5.080		
	Total	2509.421	440			

a. Dependent Variable: Awareness

b. Predictors: (Constant), REGR factor score 3 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 1 for analysis 1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.182	.107		76.238	.000
	REGR factor score 1 for analysis 1	-.730	.107	-.306	-6.798	.000
	REGR factor score 2 for analysis 1	.092	.107	.038	.855	.393
	REGR factor score 3 for analysis 1	-.341	.107	-.143	-3.172	.002

a. Dependent Variable: Awareness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.338[a]	.114	.110	2.253

a. Predictors: (Constant), REGR factor score 3 for analysis 1, REGR factor score 1 for analysis 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	285.845	2	142.923	28.153	.000[b]
	Residual	2223.576	438	5.077		
	Total	2509.421	440			

a. Dependent Variable: Awareness

b. Predictors: (Constant), REGR factor score 3 for analysis 1, REGR factor score 1 for analysis 1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.182	.107		76.261	.000
	REGR factor score 1 for analysis 1	-.730	.107	-.306	-6.800	.000
	REGR factor score 3 for analysis 1	-.341	.107	-.143	-3.173	.002

a. Dependent Variable: Awareness

APPENDIX B

DICTIONARY OF CODES

Company Mission	Company X delivers innovative, customized and high quality solutions and turnkey lines, designed to satisfy the automation needs and the product handling of our customers, in order to improve their operation efficiency and to increase their production capacity.
Company Vision	By 2025 Company X will be a global player in the automation industry, and specifically in providing digital solutions for the smart factories of the future.
Number of Employees	200 employees
Companies Approximate Gross Income	Over 15 million euros per year
Number of Countries the company is operating in	Middle East, Europe, USA and Africa
Digital Transformation implementation	• Our creative solutions will turn some heads! Mixed Pallet solutions, Automatic Truck Loading, combined tray and crate packing for cups and pots, and IIoT for Industry 4.0 • Planning to expand and you prefer a hands-off approach, avoiding headaches? Our turnkey, end-to-end solutions will fit within your current business process without complication.
Company CSR	We care for the welfare of our society and for the protection of our environment..
Cultural Context	• Solutions that meet international Company X, quality & safety standards. • Commitment to provide: ◦ Excellent customer support throughout our value chain. ◦ Excellent after sales services & maintenance. Solutions with optimized cost
Strategic Context	• Innovative and customized automated solutions & turnkey lines for efficient product handling.
Managerial Context	We strongly encourage and reward innovation, creativity and personal initiative.
Organizational Context	We build long term relations with our stakeholders, our team, our suppliers and our customers based on trust, loyalty, mutual support and open communication.

External Factors	We are Servant Leaders: We cultivate rich relation with our team, based on mutual respect, and we develop their personal and professional skills.
Technological Infrastructure	Every customer looking to improve and expand their operation will find what they need: • Producers of food & beverage, water, dairy, Home & personal care, edible and lube oil looking for a complete line? Our Empty Bottle lines, Palletizing & Depalletizing, Packing, Crate and Pallet distribution, big bottle lines as well as advanced inspection systems, are the way to goo • Searching for special solutions not available from your usual supplier

APPENDIX C

Interview layout

Questions:

1- Please describe your position and your responsibilities in your company:
2- How much experience do you have in the field of digital transformation, Internet of Things (IoT) or Industry 4.0?
3- According to you what is digital transformation?
4- What was the external and internal driver for the digitalization?
5- Describe the cultural challenges you are facing in implementing digital transformation. (empowering the people, business measurement systems, collaborative culture)
6- Describe the strategic challenges you are facing in implementing digital transformation. (internal/external capability, digitalizing within partners, knowledge of digitalization and its benefits, exposure to the international market, Security concerns)
7- Describe the managerial challenges you are facing in implementing digital transformation. (top management support, leadership)
8- Describe the organizational challenges you are facing in implementing digital transformation. (Resources, Resistance to change, workforce lacks the skills needed, employee training, organizational agility, Insufficient funding, Bureaucracy)
9- Describe the external challenges you are facing in implementing digital transformation. (government incentives, support from the political framework, internet infrastructure in the country, Legal or regulations restrictions, Consumer)
10- Is there any other challenges or barriers you are facing during the transformation towards Industry 4.0?
11- How are you overcoming those of the barriers?
12- Why other companies are not going digital in your opinion.
13- How do you assess the current implementation status of Industry 4.0 projects in your market?
14- Do you consider your experience with digitalization as a successful one?
15- Do you have any specific recommendations for the adoption of Industry 4.0?

APPENDIX D

Questionnaire layout

"Thank you for taking the time to complete this questionnaire, which is developed by Mrs. Eliana Salameh, an MBA student at Notre Dame University - Louaize, Lebanon under the supervision of Dr. Mira Thoumy, assistant professor in management. This survey aims to investigate the application of digital transformation and industry 4.0 in the Lebanese manufacturing industry and explore the barriers that prevent its implementation. Your answers are essential for reflecting accurately the challenges of the Lebanese manufacturing companies in the implementation of digital transformation in order to benefit from all improved efficiency and flexibility, improved customer satisfaction, reduced risk, and maintain a continuous improvement.

The findings of this study could be used in articles that might be published, as well as in academic presentations. All the information you provide will be confidentially treated. Companies and respondents will remain anonymous throughout the research.

This survey should take approximately 10 minutes to complete. Please understand that your participation is entirely on a voluntary basis and you have the right to withdraw your consent or discontinue participation at any time. If at any time you would like to stop participating, please do so by clicking on the “end survey” button on the top right of the page.

There is no monetary compensation for the study; it is a contribution to the advancement of knowledge in the field of digital transformation, applied to the manufacturing industry in Lebanon. At the end of the study, we can send you the results upon your request. Thank you for the time you will provide to fill the below questionnaire; if you have any questions, queries or would like to have more information about this thesis, please feel free to contact me on elianasalameh@hotmail.com or by phone on 70597155.

Thank you

Eliana Salameh"

1- In which year was your company established?
   - 1980-1990
   - 1990-2000
   - 2000-2010
   - 2010-present
   - Before 1980

2- Number of employees
   - Less than 10
   - 10-40
   - 40-100
   - 100-200
   - More than 200

3- Company Approximate Yearly Gross Income
   - $1-$100,000
   - $100,000-$500,000
   - $500,000-$1Million
   - $1Million-$5Millions
   - Above $ 5 Million

4- Countries you are operating in
   - Middle East
   - Europe
   - Africa
   - Asia
   - USA
   - Others:

5- Do you have any type of digital transformation implemented in your company?
   - yes
   - no

Respondent's Characteristics

6- Gender
   - o Male
   - o Female

7- Age
   - o 21-25
   - o 26-30
   - o 31-40
   - o 41-50
   - o 51-60
   - o Above 60

8- Education Level
   - o Grade 12 / Terminal
   - o National and Technical education (BT, TS)
   - o Bachelor’s degree
   - o Master’s degree
   - o PhD

9- Current position in the company
   - o Top manager
   - o General manager
   - o Operations manager
   - o Production manager
   - o Engineer
   - o Quality manager
   - o Regional manager
   - o Foreman
   - o Others:

10- How long have you been working in your current company?
   - o Less than 1 year

- 1-5 years
- 6-9 years
- 10-15 years
- More than 15 years

11- Total years of work experience

- Less than 1 year
- 1-5 years
- 6-9 years
- 10-15 years
- More than 15 years

Awareness of digital transformation

12- Rate the following questions on a scale of 1 to 10 : 1 being completely disagree , and 10 being completely agree.

To what extent do you consider your company aware about digital transformation?

	0	1	2	3	4	5	6	7	8	9	10
My company is aware about digital transformation	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
My company is aware about the benefits of digital transformation	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
My company is ready for digital transformation	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

Barriers for digital transformation

Rate the following questions on a scale of 1 to 10; 1 being completely disagree, and 10 being completely agree.

The following factors act as barriers to the readiness for digital transformation in your company:

	0	1	2	3	4	5	6	7	8	9	10
Lack of economic stability	○	○	○	○	○	○	○	○	○	○	○
Lack of advanced internet	○	○	○	○	○	○	○	○	○	○	○
Legal or regulations restrictions	○	○	○	○	○	○	○	○	○	○	○
Consumer is not willing to adapt digitalization	○	○	○	○	○	○	○	○	○	○	○
Lack of government incentives	○	○	○	○	○	○	○	○	○	○	○