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***“Digital Transformation, Business Models And Competitive Advantage In The
Manufacturing Industry: A Study Of Leaders Around The World”***

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***“Digital Transformation, Business Models And Competitive Advantage In The
Manufacturing Industry: A Study Of Leaders Around The World”***

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Abstract

The purpose of this work is to study and thoroughly investigate the factors and business models that lead to the acquisition of a competitive advantage for leading companies in the manufacturing sector, such as Siemens, Bosch, Tesla and Toyota. In this study, in order to satisfy the research needs, the literature review method was used and a thorough study of researches was attempted, as well as their critical overview for the examined issue of digital transformation and comparative analysis of these successful and profitable firms. This research method helps to the comparative analysis of the competitive strategies among these firms.

Keywords: Digital Transformation, Business Models, Competitive Advantage, Manufacturing Sector

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1. Introduction

Undoubtedly, the competition that exists today in modern businesses in the manufacturing sector is one of the most important elements in business branch. Given the state and importance of this business competition, each company treats with great seriousness and attention and tries to the maximum extent in order to gain a competitive advantage and have a dominant position in this sector. Therefore, the factors that determine the achievement of competitive advantage for the examined businesses, such as Siemens, Bosch, Tesla and Toyota are mainly the innovative technologies, the effective manufacturing processes, the extensive infrastructure and a dedicated customer base.

However, the competitive advantage is directly linked to the adoption and implementation of the business model of these companies. So, these firms focus to a large extent on the utilization and application of innovative methods, in order to produce modern, advanced and quality products, which will fully serve the needs of consumers. These enterprises invest particularly in fast production and for this reason such firms give enormous importance to the improvement of systems and corporate processes, but also to the advantages of digital transformation.

Consequently, in the context of the specific work, an attempt is made to analyze and critically evaluate the factors that contribute to the acquisition of the competitive advantage for these companies and how this is connected with the business model that these firms follow and the degree of utilization of digital technologies.

For these reasons and for the needs of this study, a literature review will be conducted, as well as a research methodology will be carried out which will be based on secondary data, regarding the comparative analysis of distinguished companies in the manufacturing sector and their corporate models.

Therefore, the specific work has the below structure:

The first chapter is an introductory approach and refers to the goals, needs and the following structure of this study.

The second chapter constitutes a thorough and quite comprehensive literature review, concerning mainly the leading firms in the manufacturing field, which attempt to acquire and maintain long-term competitive advantage through the improvement of their business strategies and via digital transformation. More specifically, this chapter focuses its importance literally on the competitive advantage and the most basic factors, that contribute decisively to its acquisition and maintenance on a long-term basis. Also, emphasis is placed in the context of this chapter on the benefits of digital transformation for businesses in the manufacturing industry and how the competitive advantage is linked to these advantages.

The third chapter of this study gives emphasis on the research methodology, which is based mainly on secondary data and its goals. Emphasis is also given on a comparative analysis between manufacturing companies and a detailed reference to certain manufacturing firms, in order to realize the digital transformation and the competitive advantages of Bosch, Siemens, Toyota and Tesla. The basic research questions that will be answered in the framework of the secondary analysis are: how do businesses utilize digital transformation and what advantages do they gain from this process, what conclusions are extracted from the comparative analysis of businesses in the manufacturing sector concerning the integration of digital technologies into their corporate strategies and models and finally what is the contribution of digital transformation to the acquisition of a competitive advantage for leading companies in the manufacturing industry.

Then, the main results of the research methodology follow, as well as the basic conclusions and the used bibliographical references of this study.

2. Literature Review

Indisputably, in the context of intense competition, which prevails in the contemporary business environment, firms constantly attempt to respond effectively to the changes, demanding conditions and constant challenges of today's corporate environment in order to remain viable, competitive, successful and profitable.

These companies achieve this goal by gaining and maintaining a comparative advantage over the rest competing businesses. This comparative advantage refers mainly to the unique characteristics or strategies or business models that a firm possesses or develops in order to have a better corporate performance against the other competitive organizations (Farida and Setiawan, 2022).

Thus, an effective way to obtain a competitive advantage is through the differentiation of their products, which satisfy the demands and expectations of the most demanding customers.

For this reason, apart from their business model and digital technologies, these companies must exploit in a positive way their positive points, such as their effective business strategy, their brand value, their strong organizational value, their high brand positioning, as well as their innovative tactic. Also, they have to improve their weaknesses, such as the high cost of their products and they must be able to face the serious threats of today's demanding business environment, like the intense business competition. Moreover, these firms must utilize effectively the opportunities, such as the improvement of their corporate reputation and the extension of their business activities into new markets (Goldring, 2015).

In this way, these companies will have the opportunity to take effective corporate decisions, improve their business strategies and differentiate their products in comparison with other competing firms.

For the above reasons, in today's demanding corporate context, firms strive to obtain a competitive advantage and improve their general performance and effectiveness in the market. To acquire these competitive benefits, these enterprises implement strategies in order to be innovative, adopt in an effective way the digital technologies

and restructure the product price, quality, cost, and their digital abilities, in their effort to adapt their operations to the unstable market conditions. So, digital technologies contribute to the improvement of organizational tactics, to the better management of supply chain, to the enhancement of business activities, to the limitation of production costs, to the amelioration of the quality of goods, to the development of more innovative products, to the boost of market share and to the satisfaction of customer needs (Shekarian, 2020).

2.1 Competitive Advantage

2.1.1 Competitive Advantage: Definition and Purpose

Concerning the definition of competitive advantage, according to Hao Ma (1999), competitive advantage derives from the various characteristics of companies, which allow them to create more value than other competitive firms. Also, Hao Ma states that the competitive advantage refers mainly to the "asymmetry or the diversity that exists in the characteristics or in factors of each firm that allows a company to serve the needs and expectations of customers better than its competitors and as a consequence to create higher value to the consumer public and achieve better corporate performance". However, competitive advantage should not always be linked to higher business performance. Particularly, the obtainment of a specific comparative advantage does not necessarily mean the achievement of greater corporate performance, but simply that this specific firm satisfies the demands of customers in a better and more efficient way. Thus, the greater business performance presupposes that the company possesses an abundance of competitive advantages, which should be renewed on a regular basis (Hao Ma, 1999).

According to Porter (1985), the competitive advantage results from the company's capability to create value to the customer public, which exceeds the cost of this creation. More specifically, value is what customers are willing to pay and superior value is created by the offer of products with similar characteristics at lower prices than the rest competitive companies or by offering unique products. There are therefore two basic forms of competitive advantage: "cost leadership and differentiation (Hao Ma, 2000)". In other words, the competitive advantage of cost leadership refers to the ability of a company to produce and offer its products to the

lowest cost. On the other hand, the competitive advantage which is based on differentiation has to do with the uniqueness and diversity of some features of the products, which are perceived by the customers, making them willing to pay a higher price in order to acquire them (Papadakis, 2007).

In general, it could be highlighted that a company obtains competitive advantage when it creates high economic value than other competitors (Rothaermel, 2008). The term "economic value" means the difference between the customer's perceived value and the total unit cost of the product. So, competitive advantage is determined by the difference between the value perceived by the customers and the cost in order to produce the products, always compared to competitors. As a result, if the economic value that creates a company is greater than that of other competitive firms, then this business obtains the competitive advantage (Farida and Setiawan, 2022).

Moreover, companies that follow the cost leadership strategy aim to produce a product or service at the lowest cost in the industry and this tactic leads them to the obtainment of competitive advantage. The result of the above condition is the provision of products at the lowest possible and competitive price. This type of strategy is usually associated with businesses with high capacity and relatively low product differentiation, which are however completely acceptable to the majority of customers. At the same time, experience is required regarding production processes, investment in modern equipment as well as effective quality control, so that competing companies cannot approach such a low cost for the same product (Georgopoulos, 2013). In any case, companies that succeed in the cost leadership strategy have some strengths (Wang, Lin, Chu, 2010):

- access to capital required to invest in assets such as production equipment,
- ability to design products for efficient manufacturing,
- high level of expertise in manufacturing process engineering and experience,
- access to low-cost but high-quality raw materials,
- low costs in processes such as research and development, sales, advertising and
- effective distribution channels.

2.1.2 Factors Influencing Competitive Advantage

The general factors which can affect the acquisition of a competitive advantage in a business are the quality, efficiency, innovation, as well as the customer responsiveness.

There is no doubt that these factors are interdependent. For example, superior quality can lead the firm to increase efficiency, while innovation can enhance quality, efficiency and customer responsiveness.

Concerning competitive advantage, it is stated that there are three sources for its obtainment, according to Hao Ma (1999). The first is relied on the company's assets, which offer a significant advantage against competing businesses. Typical examples of these assets are strong market share, scarce resources, superior organizational culture and positive corporate reputation. A business may own some or all of these assets, creating in this way its competitive advantage.

The second source of competitive advantage is the firm's access to the productive factors. In this case, the extent to which the company can approach the consumers and perceive their needs is also considered. This access may be better than that of other competitive firms. But, it is important for a business to secure its resources, capabilities, knowledge and market access and to restrict other firms from acquiring them. The relationship of the business with its external environment, such as its suppliers, partners, distributors and governmental organizations, significantly determines this source of competitive advantage. So, the firm outperforms its competitors by increasing its accessibility to productive factors and by enhancing the approach of consumers (Ahmad, Bosua and Scheepers, 2014).

Moreover, the third source is based on knowledge, skills and abilities. In this way, the company carries out its business activities more efficiently and effectively than the other competitors. In this case, great emphasis is placed on carrying out corporate activities, such as production, sales and distribution, know-how and recognition of market opportunities, which play finally a catalytic role (Abdulwase *et al.*, 2021).

Innovation does not only result from the products and services provided. It also derives from the business processes followed, which may be related either to the

reduction of production costs, or to the production of new products. Finally, highly innovative companies are constantly looking for improved products, services and production methods and at the same time seek to strengthen their forces and available resources (Boer and During, 2001).

2.1.3 Achieving Competitive Advantage

According to the differentiation strategy, competitive advantage is achieved by providing a unique product or service usually of greater value than that provided by the competitive firms, but with many comparative advantages. These are innovative products, of high quality and technological specifications that can hardly be copied or replaced by substitutes. This strategy builds strong relationships between the two parties. The products are unique and a stable and satisfied consumer public is gradually being formed, which does not easily look for new products (Georgopoulos, 2013). At the same time, it is clear that companies that succeed in a differentiation strategy often have strengths such as (Wang, Lin, Chu, 2010): highly specialized and creative product development team, strong sales team with the ability to successfully communicate product capabilities, corporate reputation for quality and innovation. So, a firm that implements a differentiation strategy is able to achieve a competitive advantage over its rivals due to its ability to create barriers to entry for potential entrants by creating customer loyalty through quality offerings, advertising and marketing techniques.

On the other hand, companies following a cost leadership strategy aim to produce a product or service at the lowest cost in the industry. The result of the above strategy is the provision of products at the lowest possible and competitive price. This type of strategy is usually associated with companies with large capacity and relatively little differentiated products, which are however absolutely acceptable by the majority of consumers. At the same time, experience is required in terms of production processes, investment in modern equipment as well as effective quality control, so that competing companies cannot approach such a low cost for the same product (Georgopoulos, 2013). In any case, companies that succeed in the cost leadership strategy have some strengths (Wang, Lin, Chu, 2010): ability to design products for efficient manufacturing, high level of manufacturing process, know-how and experience, access to low-cost but also high-quality raw materials, low costs in

processes such as research and development, sales, advertising and more effective distribution channels.

However, there is the focus strategy, which aims to the acquisition of a competitive position in a smaller share of the market, whether this is related to the geographical location or to the customers on which the company focuses and can be achieved either by providing a product at a lower price, or by differentiating in order to meet more needs of customers. Such a strategy focuses on a specific segment of the market, which may concern buyers in a specific geographic location or with particular needs and desires, and in each case the company aims to serve them effectively and to the maximum extent. As a consequence of the above, companies that follow such strategies gain strength in relation to their competitors, based on the differences between market segments (Georgopoulos, 2013).

2.1.4 Importance and Benefits of Competitive Advantage

There is no doubt that the success and the effectiveness of a firm are significantly determined by the attractiveness of the sector in which it operates and by the obtainment of its position within this field.

A firm can acquire a competitive advantage over other competitive companies when its corporate performance is higher than that of the industry average. This advantage results from the characteristics of a product, which make it superior to other rival goods (Ghasemi *et al.*, 2015).

So, the achievement of sustainable competitive advantage constitutes to a large extent an aspiration of the business strategy of a firm in the manufacturing field. More specifically, competitive advantage investigates thoroughly the economic aspects of a company's activity, focusing primarily on its ability to generate additional return on capital and link its business strategy to fundamental economics and the capital market for a longer period of time. Moreover, a firm's competitive advantage is what allows this company to achieve good returns for its shareholders. Thus, we can conclude that obtaining a sustainable competitive advantage may be the most significant goal of any organization and may be the most important feature that any firm should focus on (Hoffman, 2000).

Consequently, the advantages of gaining a competitive advantage are many and important for the success of a firm in the manufacturing sector. The most significant advantage is that it can contribute to the increase of the market share that this specific business possesses. This means that when a company has more competitive and differentiated products compared to other competing firms, then it is quite possible to grow its market share (Widuri and Sutanto, 2019).

Apart from the increase of market share, another important benefit of earning competitive advantage is that this company can achieve higher profit levels. In other words, if a company produces more differentiated, qualitative and innovative products compared to other similar competitive brands, then consumers would prefer to buy them even at higher prices, in order to satisfy their purchasing demands and desires and thus this business is more profitable (Gupta *et al.*, 2020).

Another advantage of having a competitive advantage is that this company can obtain greater corporate reputation and brand equity. In this way, this company acquires a leading and unique position in the industry and has the potential to further attract new customers and retain existing ones. Thus, long-term relationships are created with customers, who are loyal and dedicated to the company and its products (Dimitrova, 2014).

2.2 Business Models in the Manufacturing Sector and Competitive Advantage

A Business Model is the plan, which a business in the manufacturing sector uses in order to make money and increase its profitability. This means that it constitutes the explanation of how a firm in the manufacturing field create value for its customers at the corresponding cost. This includes descriptions of offered products or services, the delimitation of the target market and the required expenses (Filomena, Neto and Duffey, 2008).

The business model allows entrepreneurs to test, examine in different ways, structure the business costs and revenue the corporate streams.

For new companies in the manufacturing sector, exploring different business models can help determine whether their business idea is viable, whether it will attract investors and can guide overall management strategy.

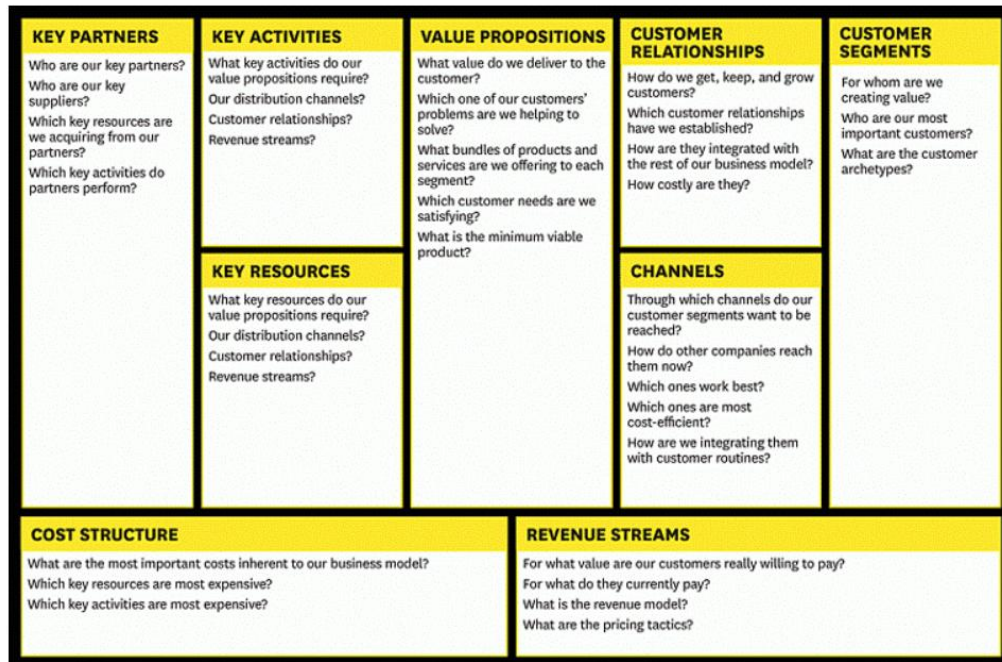
On the other hand, for existing businesses in the manufacturing field, it acts as a basis for creating financial forecasts, setting milestones and creating a work base for revising the business plan.

2.2.1 Traditional Business Models

Before describing the traditional and advanced business models, it is important to refer to the definition and the components of the business models, in order to realize better their importance and value. So, the Business Model is a strategic management template for developing new or documenting existing business models. It is a visual presentation of summary data and information that describes the value, infrastructure, customers and financials of a business or product. It helps businesses align their activities and take strategic decisions (Crossan & Apaydin, 2010).

More specifically, the elements that constitute the business model are the key partners, key activities, key resources, value propositions, customer relationships, channels, customer segments, cost structure and revenue streams. These elements are further analyzed in the diagram below.

Diagram 1. The elements of a Business Model



Source: (Braunholtz-Speight et al., 2018)

In today's rapidly changing and competitive business environment, comparing traditional and improved business models constitutes a topic of vital importance. For this reason, firms in the manufacturing sector have to adapt and improve their corporate operations, procedures and strategies in order to remain competitive.

Particularly, traditional business models in the manufacturing industry are based mainly on well-organized supply chains and on good and long-lasting customer relationships. These models involve predefined procedures and are characterized by their great stability (Enke *et al.*, 2022).

A major feature of these business models is the importance, which is given on interpersonal relationships with customers and potential consumer public. This kind of relationships has a significant role in the increase of sales and profits and in the maintaining of customer engagement (Guenzi and Pelloni, 2004).

These face-to-face interactions give to the manufacturing firms the opportunity to understand the preferences, trends, habits and requirements of customers better, with the ultimate goal of satisfying them through their manufactured products, so that customers will again prefer the specific company in the future so as to obtain the products they desire (Casaca and Miguel, 2024).

Moreover, in many cases, these traditional business approaches have the tendency to adopt a specific hierarchical structure, which includes definite roles, duties and initiatives (Lazarević and Ružičić, 2023). This implies increased corporate organization, but it has many disadvantages for the company's immediate response to the changing needs of the consumer public.

Therefore, the traditional business pattern in manufacturing sector is mainly focused on the production of products, utilizing precious and necessary raw materials and a standardized production procedure. Then, manufacturing companies sell their finished goods to other partner businesses and distributors or these firms have the opportunity to sell their products directly to retail customers (Osterwalder & Pigneur, 2010).

So, the main types of traditional business models in the manufacturing sector are the below:

- Many firms produce goods in large quantities for resale purposes. These companies typically follow their production lines in their factories, where raw resources are transformed into final goods.
- Apart from the manufacturing business model, there is the distributing business model, where distributors play the significant role of mediator among the manufacturing companies and the retailers. Specifically, these intermediaries purchase products on a wholesale basis from manufacturing organizations and resell these goods to retailers or other corporations.
- Except for the distributing and wholesaling business model, there is also the retailing business approach, in which firms can sell goods to consumers in a direct way.

The companies however in the manufacturing sector adopt mainly the manufacturing business model.

The manufacturing businesses foster effective business models in order to design products with high performance, following the regulatory standards and satisfying the needs and expectations of customers (Bocken, 2023). These elements give the opportunity to manufacturers to stand out in the challenging and competitive manufacturing field.

Consequently, the competitive advantage of these traditional business models of manufacturing companies results from their long-term reputation, established customer bases and trusted reliability. In this way, these firms have created a long-standing corporate credibility in the manufacturing community and this is very important for their growth, progress, development and sustainability (Smith, Rupp and Motley, 2013). This means that due to the long-term customer and business relationships, the clients have increased engagement with the goods of these manufacturing corporations and with their consistent quality.

However, traditional business models are characterized generally by short response times and by slow resistances to changes. But, the absence of digital business models can lead to unexploited opportunities and to reduced effectiveness (Feliciano-Cestero *et al.*, 2022). This means that digital business models, to which we will refer further in

the continuation of this work, in contrast to traditional business models, help manufacturing organisms to respond more quickly and effectively to customer needs, desires and preferences, as well as to technological advancements and competitive trends. For this reason, it is imperative for manufacturing companies to combine traditional business models with digital business approaches and strategies, so as to thrive in the demanding business environment, embracing the advantages of digital transformation and other innovative methods in order to remain unique and competitive in the manufacturing market (Osterwalder & Pigneur, 2010).

2.2.2 Challenges of Traditional Business Models

Except for the advantages of traditional business models in the manufacturing branch, such as the long-standing corporate reputation, the long-term customer relationships, as well as the increased chances for business growth, development, sustainability and reliability, there are however some challenges, difficulties, obstacles and drawbacks. The most important disadvantages are the delayed response times and the restrictions for changes and for the adoption of more contemporary technologies and innovations (Hoppe, 2002).

It is a fact that the absence of digital technologies, methods and tools in the manufacturing sector has negative consequences for the overall productivity, functionality and effectiveness of manufacturing firms (Kupriyanova *et al.*, 2023). This means that these companies do not have the chance and opportunity to respond to the technological advancements, to the digital transformation and consequently to the customer demands and expectancies. All these undesirable factors definitely affect in a negative way the competitiveness, viability, adaptability and efficacy of manufacturing entities.

In order for these manufacturing firms to overcome these difficulties and serious challenges, they have to adapt their operations and business strategies to the needs of digital transformation, so as to obtain a leading position in the manufacturing market (Abdallah, Shehab and Al-Ashaab, 2021).

In other words, businesses, in order to thrive in today's demanding and competitive environment, they must adopt digital business models and innovative methods. This shift from traditional corporate models to digital business models is necessary in

today's digital era due to the intense business competition, the digital transformation, the high technological advancements and the changing consumer habits, patterns and trends. All these factors are linked to a large extent with the huge evolution of the internet, the development of social media and because of the online presence of contemporary firms. Also, another significant factor that plays a decisive role in the transition to digital business patterns is the covid pandemic, which necessitated the adoption of digital methods and technologies in the branch of manufacturing. However, this unprecedented change required the implementation of organizational variations, the immediate and effective adjustment to the technological complexities, the adoption of more innovative methods and the accomplishment of careful strategic planning (Nosike et al., 2024).

In the next subsection of this work, we will analyze to a greater extent the digital business models, their advantages and the future development of these models (Brettel, Friederichsen, Keller & Rosenberg, 2014).

2.3 Digital Transformation

First of all, digital transition in the manufacturing market contributes to the utilization of digital tools to advanced manufacturing procedures with the purpose of increasing their functionality, improving the quality of the produced goods and augmenting their general effectiveness. Digital integration in manufacturing field includes the incorporation of developed digital technologies, such as artificial intelligence systems, the Internet of Things tools and augmented and virtual reality systems. Incorporating these upgraded technologies enables these companies to form a smart and interconnected manufacturing context, which improves the effectiveness of the manufacturing procedures (Kraus et al., 2022).

Intelligent manufacturing systems restrict the possibilities of errors during the production process, saving in this way valuable production time. As a consequence, more products are produced in a shorter time period and there is more time for the development of new, innovative and prototypes goods (Holubek and Kostal, 2012). All these parameters urge the manufacturing organizations for higher production effectiveness, more effective usage of available business resources and for higher

production levels, responding to the increased demand and for the improvement of the business operation, as we can see in the following diagram.

Diagram 2. What is Digital Transformation



Source: (Digital Transformation: definition and importance, no date)

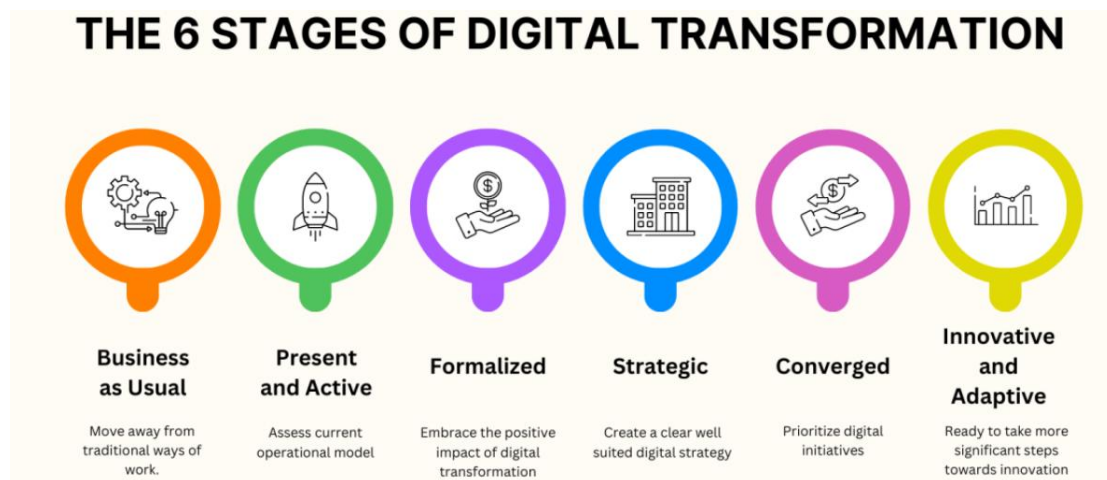
2.3.1 Digital Transformation and the Consequences on the Business Models of Manufacturing Sector

Digital transformation provokes a major technological transition in manufacturing industry, enabling the creation of innovative products and the adoption of more automated manufacturing processes. This means that the manufacturing sector faces intense challenges in today's era and is forced to follow the digitalization trend, utilizing digital technologies and advanced tools, in the production procedures (Zangiacomi et al., 2020). In this way, there is improvement in the quality of the products, in the operational efficiency, in the satisfaction of customer needs and in the limitation of production and operational costs.

Adopting digital technologies in manufacturing field creates crucial changes in the production environment, in the corporate capabilities and in the overall operation of manufacturing organizations (Schuh et al., 2017). This digitalization however involves six stages. The first stage is computerization, where computer systems are used for the more effective execution of corporate processes. The second stage is connectivity, which imposes the transition from traditional business models to digital ones and entails the utilization of industrial machines for communication, control, automation, for the increase of product quality and for the simplification of decision-

making processes. The third stage is visibility and it gives the opportunity to a manufacturing firm to monitor important information and data about the corporate activities, manufacturing and production procedures and supply-chain. The next stage is transparency and this step is significant, because the collected information, are better processed and analyzed in greater detail, enabling the manufacturing business to understand why some corporate activities and events take place and the main causes of their creation. The fifth step is predictive capacity, in which the manufacturing firm makes predictions about future scenarios that are going to happen in the context of the conduct of corporate activities. The final step is adaptability, where the production methods and the procedures of manufacturing businesses have to adapt in real-time demands, in the increasing needs of the market and in the constantly changing conditions in the manufacturing sector. This means that there will be significant improvements in the manufacturing skills, competencies and performance. Also, digital tools, such as advanced automated systems, robotics and artificial intelligence help manufacturing companies to optimize their production process, limit their costs to a great extent, improve the quality of their products and increase their corporate effectiveness. In the case that manufacturing entities follow and implement these steps, then these firms are in a position to obtain more benefits from the utilization of digital technologies in their corporate, manufacturing and production activities (Wilcox & Bugni, 2023).

Diagram 3. The Steps of Digital Transformation



Source: (Malak, 2025)

2.3.2 The Implications, Strategic Challenges, Opportunities and Dynamics of Digital Transformation

Digital integration despite it requires increased sums of money for investments on technological tools, it helps gradually to cost savings. Due to the significant limitations of weaknesses and inefficiencies in the production activities, digital transformation leads to higher productivity, effective management of risks and to better and more reasonable decisions, as well as to increase in the production line (Wang, 2021).

Moreover, digital incorporation helps to the increase in safety concerning the typical functions in the manufacturing companies to a new and improved degree. Real-time observing, immersive education and automation systems contribute to the avoidance of accidents during the production processes and to the assurance of compliance with safety rules. More specifically, artificial intelligence tools contribute to the accurate prediction of upcoming threats and challenges concerning the potential risks on the manufacturing and production procedures, by collecting, editing and interpreting historical elements. AR and VR tools from the other side help to more efficient training of employees. Furthermore, IoT systems supervise the conditions of the production equipment and the manufacturing conditions, which help to the detection of problems and avoidance of their unwanted implications (Liu *et al.*, 2022).

The extended usage of big data and analytics provides useful data to manufacturing entities for the state of production line and the mechanical equipment. Additionally, they can contribute to the forecasting of obstacles, shortcomings and weak points of manufacturing actions, to the detection of failures in the mechanical devices. As a consequence, manufacturing entities can take better strategic decisions and proceed to improvements if needed (Delgado, 2015).

Digital procedures and technologies enable manufacturing firms to develop goods that satisfy the demands, wishes and preferences of customers. In this way, the loyalty, commitment and devotion of consumers to their goods are increased, forming long-term relationships with these companies (Fen *et al.*, 2024).

Digital transition also urges manufacturing entities to have limited environmental consequences. The above digital technologies constitute effective methods that give to

manufacturing enterprises the opportunity to optimize energy levels of consumption, reduce waste, as well as the negative environmental implications, which imply compliance with sustainability rules (Moghrabi *et al.*, 2023).

However, apart from the above benefits of digital integration for manufacturing companies and automotive firms, there are serious challenges, that must be faced in an effective way. A major risk is the security issues, concerning the cyber-attacks, which are linked to the digital landscape. For this reason, manufacturing corporations follow cyber security solutions for the data protection, for the confrontation of these threats and for the compliance with the existing regulations, in order to have a trusted digital image (Mallick & Nath, 2024).

Also, there is the challenge that through digital means, consumers have the chance to express their personal needs, demands, preferences, tendencies and desires. A solution to this challenge from the part of manufacturing entities is to foster a customer-centric strategy, in order to produce personalized and targeted goods for their expectations, aiming at maintaining the positive corporate image (Dwivedi *et al.*, 2020).

Another important challenge in the digital environment is the rapid and constant changes. Manufacturing organisms must adopt and respond quickly to these changes for their better and effective operation and for the better decision-making (Chen, Despeisse and Johansson, 2020).

Operational risks are various and include organizational problems, technological challenges and inefficiencies in the production and manufacturing processes. Therefore, it is important to follow a cross-functional collaborative strategy, streamline procedures and improve the internal communication, contributing to more agile and flexible functions, activities and business processes (Loonam, Eaves, Kumar & Parry, 2018).

If manufacturing and automotive companies encounter effectively these crucial challenges, then these firms will manage to remain competitive and hold their prominent positions and their positive image in the manufacturing and automotive market (Gbadamosi, 2024).

Apart from the implications, technological developments bring about significant changes in the manufacturing firms and their production procedures, enabling these firms to improve their output, upgrade their functional effectiveness and create innovative products. However, these changes include some major difficulties, obstacles and strategic challenges for the manufacturing organizations. Nevertheless, manufacturing firms face these challenges through the adoption of digital technologies, which constitutes an issue of high importance for the effective digital transformation of the manufacturing field (Wang and Shao, 2024).

An important challenge due to the digital transformation of manufacturing sector is the existence of legacy systems, which are outdated in certain manufacturing businesses. This means that these systems are not fully compatible with advanced digital demands and needs. These outdated systems can constitute a main obstacle in the integration of digital technologies, as significant time is required for their replacement or their upgrade. For this reason, manufacturing companies have to upgrade gradually these systems, in order to maintain their operational continuity and efficacy (Abdallah, Shehab and Al-Ashaab, 2021).

Also, given the increase of digitization in the manufacturing sector, there is great risk of cyber-attacks, which can have disastrous consequences for the system's data of manufacturing firms. So, these companies must adopt an effective and protective cyber security policy, which will ensure the security of the systems of manufacturing companies (Mullet, Sondi and Ramat, 2021).

Moreover, digital transition in manufacturing industry involves the gathering and collection of several information, elements and data, from different and various origins, such as machines and customer relationships. As a consequence, the effective management of all these elements is a complex issue. Thus, manufacturing firms have to possess a unified system, which will have the opportunity to combine the data from diverse sources in an effective way, so as to make correct information analysis and take better corporate decisions (Maksimenko, Vashko & Zdrestova-Zakharenkova, 2021).

Furthermore, digital transformation provokes without doubt new needs in the context of operation of manufacturing companies. This means that new skills and capabilities

are required for the adaptation to the new manufacturing strategies. For the effective confrontation of this challenge, manufacturing firms have the obligation to develop successful management tactics, which will contribute to the adaptation of employees and corporate functions to the new innovations and technologies (Abdallah, Shehab and Al-Ashaab, 2021).

Additionally, the cost of digital shift in manufacturing organizations is quite increased and manufacturing companies must give higher priority to digital initiatives, which will yield higher rates of profitability to these businesses in the long run.

Yet, given that manufacturing sector must follow apart from the strict production specifications, stringent rules and regulations, which constitute in many cases serious obstacles for the digital transformation of manufacturing companies. In other words, manufacturing entities should give emphasis, importance and attention to the digital technologies, which are fully compliant with these regulations, so that these firms do not have functionality issues (Vogelsang *et al.*, 2019).

Finally, due to the complexity of digital technologies, tools and systems, manufacturing organizations must select the appropriate technologies in order to invest in them, which will provide flexibility, profitability and adaptability in the future.

In conclusion, if manufacturing companies manage to face the above challenges, which arise because of the digital transformation, then these businesses will have the significant chance to integrate innovations in their corporate operations and in their production procedures, obtaining sustaining advantage in the long run in the manufacturing industry (De Carolis, Macchi, Negri & Terzi, 2017).

However, the opportunities and benefits of digital transformation are many and various for manufacturing companies.

First of all, these firms have the chance to integrate new technologies and innovation in their production processes, adding more value to their goods. Also, these companies have the significant opportunity to adapt their operations, functions and corporate activities to the demands, conditions and changes of the digital world, with

the result of being more efficient, successful, adaptive, flexible, innovative, agile and competitive.

Moreover, digital transition contributes to the upgrade of production methods, to the increase of productivity and profitability of manufacturing firms, to the limitation of production expenses and to the improvement of quality of the manufactured products.

Furthermore, manufacturing entities manage to attract more customers, due to their digitalization, promoting their products on new consumers and expanding their corporate activities in new promising markets.

Digital transformation and technologies enable manufacturing organizations to produce their products faster and in a better quality, as well as to deliver them to the end customers immediately, following all the specifications and safety measures. All these factors and parameters will ensure the acquirement of competitive advantage for these firms in the future, as the characteristics of their products will prevail against the competitors (Cosar, 2022).

Additionally, the contribution of digital shift is determinant for the manufacturing companies, because these firms can invest more in the development and quality of the new produced goods.

From all the above we can conclude that in the case that manufacturing businesses exploit the benefits, advantages and opportunities of digital transformation, then these companies will have the opportunity to survive and be profitable in today's demanding, changing and competitive business environment. But, these firms must be agile in order to operate in an effective way, taking advantage of the new chances and innovations and restricting the risks and threats (Zhu, 2016, Nadkarni and Prügl, 2020).

Moreover, the dynamics and trends of the adoption of digital technologies are significant for the success, growth and competitiveness of manufacturing companies.

This means that the digital transition leads to the increase of manufacturing effectiveness and as a result there is limitation to the errors during the execution of corporate activities and production procedures. Therefore, the production processes

are faster and more effective, the utilization of available resources is optimal and the productivity is higher (Trojanowska *et al.*, 2017).

Additionally to the above, through the automation of production, the production costs are limited, but the profits and sales are improved.

Digital shift improves the corporate functions in the manufacturing sector to a great extent. More specifically, the better monitoring of stocks and supply-chain and the benefits of automation contribute to the limitation of accidents, to the restriction of human errors and to the assurance of compliance with the existing safety rules. For instance, artificial intelligence is quite helpful for the prediction of potential threats and for the better and more accurate analysis of the real-time data. Moreover, Internet of Things and the related connected devices help the manufacturing entities to control in an effective way the manufacturing equipment and the production conditions, facing on time any negative implications, which can affect the normal and smooth operation of these companies (Wang *et al.*, 2022).

Furthermore, the analysis of big data gives the manufacturing organizations the chance to extract useful results for the effectiveness and performance of the equipment, as well as for the efficacy of the manufacturing procedures. Thus, these firms can improve the negative points in their production line and take corrective business decisions, in order to remain competitive and productive (Tekler, S., Tekler, D. & Orendil, 2022).

Finally, digital transformation gives the manufacturing businesses the opportunity to develop innovative products that satisfy the demands and expectations of their customers, in order to feel satisfied and be dedicated to specific goods. In this way, the customer commitment is increased, as well as the productivity, the high quality of the manufactured products and the levels of profitability of these firms (Skog, 2019).

2.3.3 Advantages of Integrating Digital Technologies into Business Models

Digital transformation in manufacturing firms includes the utilization of modern technologies, such as artificial intelligence, which lead to growth, more effective conduct of business operations and to the stimulation of competitiveness. The impact of digital transformation on the development of new business models in automotive

companies is significant and contributes to the progress of these corporations in online business and to the lasting digitization of these manufacturing organizations.

This digital transition has also radically influenced many traditional business approaches and strategies. These traditional business models have evolved fundamentally due to the development of digital data, digital technologies and tools.

So, manufacturing entities have adopted effective business models and integrated advanced technologies in ways that contribute to innovation and to the creation of new customer experiences, based on trust, value and effectiveness. This implies that modern digitally corporate models have developed and the traditional business tactics have evolved and transformed, as new approaches have emerged, provoking better business opportunities, as well as new challenges. This means that manufacturing companies survive by adopting, fostering and implementing new, digital and developed business models in order to create more revenue streams, more innovative products, conduct in a more efficient way business operations and form better relationships with their clients. So, these entities serve better the demands and needs of customers, enhancing their ability to compete in the manufacturing and automotive industry (Agustian *et al.*, 2023).

As a result, manufacturing corporations through the digital transformation can have the opportunity to reshape their business models, in order to create more business value, limit the production costs as much as possible and design more pioneer goods, which align with the demanding expectations of consumers (Moghrabi *et al.*, 2023).

More specifically, before proceeding to the analysis of the positive and negative points of digital transformation into the business models, it is important to refer to the consequences of digital transformation into these corporate strategies and to the creation of new models due to the needs of digital transition (Moghrabi *et al.*, 2023).

Firstly, digital transition has affected a lot the retail business model, with the development of e-commerce, because many businesses try to target clients with personalized goods and purchasing experiences, as well as competitive pricing tactics and intelligent marketing strategies. As a consequence, traditional retailing business model has disappeared, because manufacturing companies strive to leverage digital

tools in order to boost customer opinions and feedbacks, streamline their supply chain procedures and form more targeted products to consumer preferences.

But, the adoption of all these digital tools apart from the advantages of digital transformation into the business models and into the corporate activities and operations, provokes many new challenges and for this reason manufacturing companies must follow strict regulations concerning the sensitive customer information and the data regarding the buying preferences of customers.

Moreover, the manufacturing business model has changed because of the emergence and development of new transformative technologies, such as Internet of Things and robotic technology. In this case, due to digital transformation and mechanization, manufacturing and automotive entities have to invest to experienced and specialized personnel in order to have the capability to operate the new digital tools and methods, but these manufacturing firms have to pay attention on the ethical and legal results of automated procedures in manufacturing companies.

Finally, as the implications of digital transformation develops, we will increasingly observe its consequences in the development of newer corporate models and in the optimization of the pricing methods of manufacturing companies, providing more personalized goods, that will satisfy the changing needs of their customers (Geissdoerfer et al., 2018).

The incorporation of digital technologies and digital transformation into corporate models enables manufacturing companies to improve their business operations, interact with the consumer public in a more effective way and compete in the demanding manufacturing industry. This means that digital technologies constitute an integral part of the corporate models of manufacturing firms in order to remain competitive and profitable (Geissdoerfer et al., 2018).

More specifically, the integration of digital tools into business strategies brings about many advantages, such as the improvement in operational effectiveness, the limitation of production costs and the creation of more innovative products in the manufacturing sector.

Digital transformation also should be an important part of the corporate models of manufacturing entities, because it gives them the significant chance to communicate closer with their existing or possible customers (Masoud & Basahel, 2023), through social media and different digital platforms. So, these organizations have the opportunity to realize customer preferences, collect useful information for their desires and create products that respond to their personalized needs and expectations. This opportunity contributes to the fortification of relations with customers, who feel commitment and dedication to the company's products.

Moreover, digital transition provokes positive changes in the development of business models of manufacturing corporations. In other words, there is modernization and upgrading of corporate processes and operations, with the result that these firms respond quickly and efficiently to demanding conditions of the manufacturing industry and market. Therefore, such business models give these corporations the opportunity to have a more constant and maintainable revenue stream (Lindström et al., 2023). In that way, these businesses have the significant chance to predict better their revenue and form stronger relations with the consumers. Additionally, customers have the tendency to be more dedicated and loyal to the products of these manufacturing companies, because they feel increased pleasure and satisfaction.

Furthermore, digital technologies provide these companies with the chance to expand their corporate activities, utilizing the power of social media and online platforms and promoting their products worldwide.

2.3.3.1 Importance of Data and Analytics in Decision – Making Process

Data analytics have a significant role in the procedure of decision-making by giving the important chance to manufacturing entities to convert useful information into valuable knowledge. Through processes of vital importance, such as data mining and extracting, predictive methods, and machine cognition, these organizations can detect patterns, forecast models and take crucial and evidence-based decisions. Particularly, this means that the importance of data analytics is great for the increase in operational effectiveness, enhancement of customer dedication and for the acquirement of long-term competitive advantages, limiting the serious risks in the demanding data-centric context (Adesina, Iyelolu and Paul, 2024).

In other words, the opportunity to gather, elaborate, analyze and illustrate huge amounts of data and information has changed in a positive way in which manufacturing firms companies execute their corporate activities and functions, enabling these companies to make informed and successful business decisions. These decisions refer to customer trends, market conditions, operational effectiveness, product development, marketing policies, price tactics, sales strategies and competitive methods (Musaigwa, 2023).

Also, the interpretation of these datasets helps these entities to understand and realize better the customer needs and the market demands and the improvements that must be implemented in their business operations for their corporate success (Theodorakopoulos & Theodoropoulou, 2024). So, such companies can respond better to customer demands and preferences, as these firms can provide to consumers personalized goods.

Through the deeper analysis of existing data on supply chain of manufacturing corporations, inventories and production procedures, these organizations can identify weaknesses and ineffectiveness, so as to adopt data-driven methods to optimize and upgrade their operations. Moreover, data analytics have a decisive role in corporate growth, development, competitiveness and innovation. By amplifying consumer data and market tendencies, manufacturing firms can realize effective corporate chances and marketing opportunities (Provost & Fawcett, 2013). These marketing strategies and chances contribute to the more effective and successful advertising of their products.

Finally, data analytics constitutes a useful tool for manufacturing companies and their corporate decisions, which are accurate and data-driven (Tiwari, 2024). These decisions have more accuracy, efficiency and quality, which affect positively the business operations, procedures and activities, adopting at the same time new innovative strategies, limiting the operational risks and outperforming other competitive firms.

There is no doubt that many manufacturing companies exploit and utilize data insights for the improvement of their production procedures, the incorporation of

innovative methods into their business models, the better decision-making and for the maintenance of their sustainability and competitiveness.

More specifically, data analytics constitutes an indispensable part of the strategies of manufacturing firms, as it contributes to the improvement and upgrading of production functions (Ikegwu et al., 2022). This method has adopted by manufacturing entities, such as Toyota and Bosch in order to improve their productive line and minimize the errors during the execution of the production processes.

Also, the collection of such data, gives the chance to manufacturing entities, such as Siemens to predict the production stream and inefficiencies, with the ultimate goal to limit disruptions and improve the lifespan of manufacturing tools, leading to important cost savings (Ren et al., 2018).

Moreover, by using a data analytics policy, manufacturing organizations, such as Tesla can improve the quality of their products, detecting their disadvantages and realizing the basic causes of these flaws (Zhang, 2023). As a result, they can limit waste and upgrade the overall quality of their goods, increasing the customer pleasure and satisfaction.

Furthermore, data analytics leads to the maximization of inventory levels, predicting better the demands of consumers and enhancing their supplier performance (Karki, 2024). This means that these businesses respond in an effective way to market conditions and customer needs.

Furthermore, data analytics helps manufacturing companies to communicate these insights with other departments, interpreting the importance of such data. This successful and direct communication contributes to the implementation of a data-driven tactic in the context of these firms, adopting a spirit of continuous innovations, with the final purpose to obtain a sustainable competitive advantage in the manufacturing industry.

Consequently, the importance and value of data insights in the manufacturing market is high, versatile and impactful. In other words, it leads to accurate predictions for business actions and procedures, to process optimization, to more operational effectiveness and to overall corporate growth and development in order the

manufacturing corporations to remain competitive in the demanding and constantly changing manufacturing landscape (McGuire, Manyika, Chui, Manyika & Chui, 2012).

2.3.4 Digital Technology, Digital Transformation, Digital Business Models and Competitive Advantage

Undeniably, digital technologies and digital transformation play a dominant role in the development, the economic growth, the competitiveness, the effectiveness, as well as in the acquirement of the competitive advantage of the firms in the manufacturing industry. This means that digital technologies contribute to the improvement and enhancement of productivity, to the development intensity and to the overall corporate competitiveness.

More particularly, the manufacturing field constitutes a significant pillar of the economic branch and a sector, which stands out for its increased degree of innovation and development. However, increasing the competitiveness and digital empowerment of manufacturing firms is an important factor for enhancing their economic and technological development and increasing the possibilities for gaining competitive advantage in the future, obtaining at the same time leadership position in the manufacturing branch. Hence, in the context of intense business competition in the manufacturing industry, manufacturing organizations have to adapt their operations, in order to face successfully international challenges and difficulties (Buffa, 1985).

Manufacturing firms, by adopting advanced digital technologies, can improve and accelerate their production processes, upgrading in this way their production efficiency and the quality of their products. By fostering developed digital technologies can improve apart from the production procedures their supply chain management and distribution of their products, as well as their responsiveness to their customer needs and demands. Also, via the utilization of big data analytics and the benefits of artificial intelligence, manufacturing entities have the opportunity to make accurate predictions and understand better market needs and customer desires, enabling them to improve the features of their products (Adner et al., 2019).

Digital technologies help manufacturing companies a lot to improve their business operations, to increase their operational efficiency, to improve the customer

experience and feedback, to adopt innovative methods and to gain gradually competitive advantage (Ritter, 2020). All these factors contribute without a doubt to the increase of competitiveness of manufacturing firms. First of all, digital transformation can improve the productivity of a business, limit significantly operational costs and increase innovation abilities. Secondly, digital technologies and tools provide these firms with advanced knowledge and capabilities. Thirdly, digital transformation contributes to the improvement of corporate reputation and organizational conditions, given that the technological characteristics of the manufactured products are improved (Wang & Shao, 2024). Also, the digital transition contributes to the adoption of digital and more advanced business models.

In contrast to traditional business models, digital business models in the manufacturing sector have utmost importance for the digital transformation, the adoption of innovative technological methods for the operations and corporate functions and procedures and for the improvement of the competitiveness of manufacturing organizations, with an ultimate goal of acquiring the competitive advantage on a future basis (Nucci, Puccioni, Ricchi, 2023).

Thus, by adopting digital technologies, manufacturing firms have the ability to execute their production methods faster and more efficiently, gaining time and reducing their operation and production costs. So, these companies produce more quality and innovative products, attract more customers, expand their business activities into new and promising markets, satisfying the market demands and the preferences of the consumer public. In this way, customers feel more satisfied, build stronger relationships with these firms and their products and then these companies have the ability to stand out and differentiate in the manufacturing industry (Vărzaru and Bocean, 2024).

Moreover, digital business models give to the manufacturing entities the important chance to target a specific buying audience, optimize marketing strategies and personalize consumer preferences, trends and behaviors (Sharma, 2024). All these factors can contribute to the success, growth, competitiveness and development of manufacturing businesses.

Apart from the above advantages and positive points of digital business models, these models have also some disadvantages, such as the need for rapid transition and adaptation to continuous technological changes and developments, which entails increased costs for manufacturing firms. Nevertheless, the benefits are more than the drawbacks in the case of digital business models for manufacturing companies (Verhoef et al., 2019).

Furthermore, digital business patterns lead to the improvement of operational effectiveness of manufacturing firms, as well as to the more effective interaction with customers. The operational efficiency can be improved, because optimization will take place in the automation of production, the management of stocks, the introduction of innovations in the production process and in the limitation of the production costs (Prince, 2024).

As a result, more innovative products will be produced, which will satisfy to a greater extent the personalized needs and desires of customers. This means that the customer engagement and loyalty will be increased significantly.

It is important to mention that digital business models will continue to evolve further in the future as more technological changes take place and customer needs become more demanding for more innovative products (Zangiacomi et al., 2020).

Consequently, digital business models and digital transformation in the manufacturing sector help manufacturing companies to survive in the demanding and complex digital environment, boost their digital capabilities, as well as their digital readiness, maturity and adaptability and increase their corporate value. Also, these digital business models give great emphasis on digital solutions, automation, digital data and on customer-centric approaches, in order to provide a positive customer opinion and experience (Moghrabi *et al.*, 2023).

Also, the goods designed and offered by manufacturing firms must be improved through the transformation procedures and via digital and advanced business models that include innovative and creative methods. More specifically, digital transformation and modern business approaches are relied mainly on three important parameters: the first is customer point of view, the second is operational procedure transformation and the third is corporate model transformation. As a consequence, in the current

challenging and difficult manufacturing environment, firms pay high attention on digital transformation and on these significant factors, in order to maintain their business success and competitiveness. This digital transition and digital solutions are relied on the use of advanced information technologies with the purpose to achieve general upgrade (Ciarli *et al.*, 2021).

The degree of adopting digital transformation and digital business models refers to the extent to which manufacturing firms exploit the modern information technologies in order to accomplish transformation in all corporate activities and procedures, such as research and development, production, sales, design, marketing and organization. Digital corporate models transform the general philosophy of value creation. To acquire long-term competitive advantage in the today's demanding manufacturing market, manufacturing companies have to reshape the basic logic of productive procedures and processes and encourage the utilization of digital transformation methods in all business activities, such as corporate strategies, business structure and operational activities. The extent of digital transition and the adoption of digital business models in all value creating procedures enhance production and the general efficiency of manufacturing corporations by ameliorating the production procedure, augmenting labor productivity and restricting the production expenses. In this way, the innovation capability of manufacturing organizations is improved and the differentiation of goods is also enhanced. Moreover, these advanced and modern business models improve significantly the relations between firms and the consumer public and enhance the devotion and engagement of clients. While the client adhesiveness may only be acquired via long-term interaction, which is complex to obtain through trading methods it will improve and maintain the competitive advantage of manufacturing firms sustainable, holding their leading position in the market at the same time (Zangiacomi *et al.*, 2020).

2.3.5 Digital Transformation Strategy

The digitalization is linked directly to development, fast growth and to the creation of innovative products. This means that manufacturing entities must adapt their production and operations to the new digital conditions, apart from the investments in advanced technological tools, in order to remain competitive and respond to the digital landscape effectively. Therefore, these firms must follow a digital

transformation strategy, which is decisive for the overall effectiveness of digital integration in the manufacturing companies. This strategy must consider every corporate activity and procedure from development, marketing, promotion, delivery to quality control and monitoring the supply chain (Ismail, Khater and Zaki, 2017).

It is also important for manufacturing businesses to fully understand the above challenges and opportunities of digital transformation, so as to develop a successful digital transformation strategy.

First of all, these companies must focus on their vision and their business goals in the present time period and in the future, before starting the establishment of this strategy. Manufacturing organizations must give emphasis on digital technologies, which will yield improvements on all the business activities and processes.

Moreover, manufacturing firms must assess carefully their digital maturity and capabilities, in order to realize better which technologies have to be updated and which procedures must be changed, improved or automated (Ismail, Khater and Zaki, 2017).

Furthermore, manufacturing corporations must focus their attention on the integration of digital applications and platforms, which will increase the access and the experience of the customer base.

Another important step for the effective implementation of digital transformation strategy is the combination of business objectives, anticipated results and available technologies into an applicable plan, in order to ensure the normal adjustment of the manufacturing entities to the demands of digital initiatives (Kane et al., 2015).

So, this strategy will help the manufacturing companies to overcome the challenges and difficulties of digitalization and exploit in a positive way the opportunities of the digital technologies, in order to upgrade their business functions and procedures.

2.3.6 Digital Transformation Management

Digital transformation management is the important procedure, which includes the incorporation of digital technologies into manufacturing companies. The goal of this specific process is to optimize corporate operations, improve the production line and

increase the value of produced goods, making customers feel satisfied. Nevertheless, digital transformation does not contain only the integration of digital tools in the manufacturing firms, but it provokes serious and significant changes in their organizational structure.

So, the management of digital transformation is required because with the adoption of new innovative technologies, the operational effectiveness of manufacturing entities is increased. Also, the advanced digital tools collect useful data and information regarding the demands, desires and preferences of customers. So, the manufacturing organizations tend to produce goods that respond to the personalized needs of customers, increasing consumer satisfaction and positively influencing their shopping experience (Kraus, Durst, Ferreira, Veiga, Kailer & Weinmann, 2022).

Moreover, digital transformation may lead to automation and to the collection of useful data, which can help to the more effective decision-making and to the limitation of the production and operational costs (Kraus, Durst, Ferreira, Veiga, Kailer & Weinmann, 2022).

Furthermore, effective management of digital transformation promotes agility and adaptability, given that manufacturing businesses adapt their corporate functions to rapid changes and to demanding market trends.

Finally, the successful management of digital transformation is needed, because this digital transition is linked to different difficulties, challenges and crucial risks, such as the integration obstacles and the disruptions in the business operations. For this reason, digital transformation management constitutes a strategy that monitors and gives efficient solutions to these risks (Hess, 2022).

2.4 Challenges and Management of Digital Transformation

2.4.1 Difficulties Integrating Digital Technologies into Business Models

In the era of digital transformation, digital technologies contribute significantly to the optimization of business models, the improvement of corporate functions, the creation of innovative products, the enhancement of growth of manufacturing firms, the increase in business effectiveness and the reinforcement of competitive advantage.

However, apart from the advantages and opportunities of digital technology, there are also certain difficulties, disadvantages and challenges that must be faced effectively (Agustian *et al.*, 2023).

First of all, one major challenge is the disturbance in incorporating digital tools and advanced systems into the existing corporation models and functions. In other words, many workers in manufacturing companies have the tendency and the daily custom to utilize the conventional procedures, facing serious difficulties in using these advanced digital procedures. For this challenge, a useful training process is required, combined with continuous learning of capabilities and functions of digital technologies and processes, in order to feel familiar with innovative technologies, adopting a positive behavior towards digital transition (Mhlongo *et al.*, 2023).

Moreover, the necessary cost for the digital transformation is quite high for manufacturing entities, because these organizations have to invest in developed systems and procedures. Therefore, manufacturing corporations must set priorities and make investments in cost-effective technologies, in order to overcome this challenge and maximize the benefits of digital conversion (Schilirò, 2024).

Given that digital transformation is linked to digital tools and data-driven procedures, there is the risk of crucial cyber threats, as well as leakage of data and information. Thus, for the protection and preservation of data, manufacturing businesses have to follow strict cybersecurity methods and solutions and adopt an effective strategy for data protection.

Because of the market disruption of digital transition, manufacturing firms must foster and implement successful corporate policies so as to differentiate their products, increase customer satisfaction and maintain long-term development. This means that such companies have to apply an effective customer-centricity strategy in order to focus on customer preferences and expectations, expanding their customer base.

Finally, manufacturing entities have the obligation to adhere to legal protocols, in order to avoid legal risks, fines and consequences, which constitute the results of the integration of new technologies into business strategies (Chen & Wang, 2018).

2.4.2 Customer Centricity Through Digital Transformation

Many businesses in the manufacturing industry have the tendency to adopt a digital strategy, which focuses on the customers, their needs, their feedback, their consumer experiences and on their expectations.

Therefore, these firms make enormous efforts to constantly integrate new and innovative digital technologies into their business models and strategies, in order to improve the quality of their manufactured products, so as to better serve the demands of customers. In this way, these companies produce personalized products, which respond effectively to the customers' preferences, desires and needs, enhancing their engagement and developing long-term and trusted relations with them (Rawat, 2016).

This customer-centric model has important value for customer pleasure and for the better decision-making procedure from the part of manufacturing entities. In today's digital era, customer-centricity approach gives emphasis on consumer demands and behaviors, offering more targeted products to them, increasing their maximum value. By adopting customer-centricity strategies, manufacturing organizations realize better that prioritizing consumers contribute to their growth, development, expansion of their corporate actions in the manufacturing market and to the obtainment of long-term loyalty and dedication from the side of customers of manufacturing corporations. All these factors lead to the increase in brand reputation, the attraction of new customers and to the enhancement of consumer lifetime value.

Furthermore, a customer-centricity policy has a significant and decisive role for innovation, growth and product development. By constantly collecting the customer's feedback, manufacturing entities realize their inefficiencies, predict the future needs and expectations, develop new, quality and innovative goods, serving the needs and desires of their target audience. This strategy helps these companies to increase their profitability and maintain their revenue growth in the future (Rawat, 2016).

2.5 Conclusion of Literature Review

In the context of this literature review, we will try to answer the following questions:

- How the digital transformation has improved the functioning of manufacturing companies?
- What are the factors of digital transformation that contribute significantly to the acquirement of competitive advantage from the part of manufacturing firms?

More specifically, digital transformation leads to higher productivity, better management of business risks and to more effective corporate decisions, as well as to increase in safety regulations and automation methods. Also, artificial intelligence means help to the more efficient management of the potential obstacles during the production processes (Liu *et al.*, 2022). Moreover, digital tools and transition contribute to the development of personalized products that serve the needs, preferences and expectations of customers (Fen *et al.*, 2024).

Furthermore, manufacturing corporations, by fostering modern digital procedures, have the opportunity to upgrade their production processes and enhance their production effectiveness and the quality of their goods. By adopting advanced digital technologies and processes can ameliorate except for the production line, their supply chain management and the distribution of their goods to final consumers, as well as their responsiveness to the wishes of the customers. Additionally, via the utilization of digital methods, manufacturing businesses have the chance to conduct accurate predictions and serve better customer needs, given that these entities possess the significant opportunity to improve the characteristics of their products (Adner *et al.*, 2019). So, the customer experience is improved and in this way the manufacturing companies obtain gradually the competitive advantage (Ritter, 2020).

3. Research Methodology

3.1 Type and Goals of Research Methodology

In this study, the secondary research methodology is used, which is based on useful data, elements and information that are gathered by other people. So, such data has already been used in other similar studies in the past for research purposes. Therefore, the official elements that are utilized for the needs of the secondary research analysis are derived mainly by peer-reviewed studies, various meta-analyses, and from other different databases and datasets.

Secondary research method is a helpful, useful and quite common analysis, which is used in the case that there isn't primary data. Thus, it is a simple and fast method, that does not cost and the researcher definitely saves time, using the secondary analysis process, as it relies on available data. Through the use of secondary analysis, the studier has the opportunity to realize the gaps in secondary data and information, which make imperative the conduct of primary research, with the ultimate goal of highlighting the main causes and the most important implications of the examined issue (Largan & Morris, 2019).

More specifically, in this study, the literature review and the method of case studies analysis are used in order to collect, investigate, analyze and interpret the existing sources for the examined topic of digital transformation, business models and competitive advantage in manufacturing companies. In this context, the analysis does not involve the collection of primary data through interviews but is strictly limited to secondary research based on published case studies and available firm-related material. Apart from the gaps, the secondary analysis gives the researcher the chance to gain valuable and beneficial knowledge, allowing the identification of the significant factors that lead to the obtainment of this advantage in the manufacturing industry. In this way, the researcher can realize if primary research is required for the most thorough analysis, study and better explanation of the investigated subject. Also, the secondary research process provides the researcher the chance to assess the current state of the secondary data and illustrate the conclusions. Moreover, except for the literature review, the case study analysis gives more detailed information about a specific issue and specific companies. In this way, the researcher can obtain specific

and in-depth knowledge about the examined manufacturing firms and may proceed to further comparative analysis of these companies and to a comparison of their competitive strategies.

The secondary analysis method has many benefits, as it constitutes a simple procedure for the collection of available research data and contributes to the reproducibility of previous elements, enhancing the reliability and objectivity of existing data and extracting at the same time useful and main conclusions.

However, there are also certain disadvantages in the case of secondary analysis. Particularly, in many cases, there is not the necessary credibility and reliability in the secondary data and for this reason the researcher should evaluate and assess in a critical way the sources, their quality and the studies (Largan & Morris, 2019).

3.2 Bibliographic Research – Secondary Data

Digital tools play a significant role in manufacturing firms, as these new technologies, combined with the digital transformation, lead to the reduction of production and operational costs of these manufacturing companies. They, also, contribute to the increase of the sustainability and effectiveness of manufacturing entities and to the obtainment of competitive advantage in the future.

Digital transition and innovative technologies help the manufacturing organizations to enhance their economic growth and development, integrate advanced tools for the production of more developed products, optimize the corporate functions and the management of their supply chain systems, making them more competitive in the context of manufacturing industry.

Consequently, the incorporation of digital technologies and systems in the business models of manufacturing businesses is considered necessary in today's digital, demanding and competitive era, in order to remain viable, profitable and effective. These technologies are beneficial for the productivity enhancement, the better management of production line and time and for the acquirement of competitive advantage gradually. Digitalization constitutes an integral part of a sustainable and successful manufacturing context. The development of manufacturing corporations started with the integration of effective supply chain procedures, the mass production

processes and the incorporation of automation methods into the manufacturing procedures (Wee, Kelly, Cattell & Breunig, 2015).

More specifically, digital transformation constitutes a customer-centric process. So, the entities of the manufacturing industry that incorporate digital tools in their corporation strategies tend to realize better the customer needs, demands, preferences and desires, communicate in a more effective way with consumers and create more personalized and targeted products that serve their expectations (Ismagilova et al., 2019). This interaction begins with the development of the produced products until the final delivery of them to the end customers and the support after the sale. This relationship in other words gives the significant opportunity to these companies to enhance their profitability levels and make the consumers more dedicated to their products and brand name.

Digital transition moreover leads to continuous development for manufacturing firms, as it helps to an important degree to the improvement of the corporation functions and activities and to the optimization of manufacturing procedures in order to operate more efficiently (Gökalp et al., 2017).

All the above advantages will contribute to the acquirement of a sustainable competitive advantage between the organisms, which have leading presence in the manufacturing sector. If these firms do not utilize digital technologies and tools in an efficient manner, then other competing businesses in this field will have more opportunities to differentiate their goods, dominate and gain the competitive advantage in the immediate future (Demirkan et al., 2016). Thus, these firms excel against the rest competitors and possess a prominent position in the manufacturing market. Finally, fostering digital systems will make these manufacturing companies stronger and more effective, as these entities have the ability to improve their products and create innovative goods that satisfy the needs of the targeted consumer audience (Horvath et al., 2018; Ismagilova et al., 2019).

3.3 Comparative Analysis Methodology

First of all, comparative analysis constitutes a concrete and detailed approach, which is utilized to assess and make useful comparisons between the manufacturing entities, in the context of this study, so as to realize and extract valuable and important

conclusions regarding their similarities and differences in their strategies concerning their digital transformation and the obtainment of the competitive advantage.

There is no doubt that digital transition improves manufacturing corporate performance importantly and constitutes an effective solution for all the manufacturing enterprises for the achievement of high-quality development, innovation and growth in today's demanding and uncertain manufacturing market.

This means that digital technologies and innovative tools, such as big data, data analytics and artificial intelligence are the main key of their digital transformation and affect in a positive way the value, the operation and the effectiveness of manufacturing corporations.

Another similarity is that digital technologies constitute the means with which manufacturing entities from all over the world respond in an efficient way to the market demands and the needs of consumers, utilizing digital tools and trying to face with a successful manner the serious pressures, challenges and threats in the context of a competitive and unpredictable manufacturing industry. The first main advantage of this digitalization is the important changes, innovations and improvements in their corporate models and strategies, which maximize their organizational and operational performance, as well as their digital capabilities (Wang, 2021).

Moreover, digital enterprises on a global basis that exploit the benefits and strong points of the digital transformation, take advantage of the information derived from digital tools, such as big data and data analytics, in order to collect useful elements regarding the needs of customers and create more personalized products to serve their demands and preferences, reducing their high production costs and enhancing at the same time the efficiency of their corporate procedures and functions. These advanced tools help manufacturing firms to gain learning abilities, more knowledge and expertise concerning the faster and more effectively utilization of digital systems with the purpose to satisfy the market expectations and adjust their business processes and operations to technological changes. But, manufacturing entities in Greece have to make more effective and accurate predictions about the main risks and challenges of digital transformation, which may affect negatively their normal operation and find effective solutions to overcome these threats.

More specifically, multinational manufacturing organizations invest huge amounts of money in digital tools, with the ultimate goal to improve their corporate actions, strategies and policies, enhance the efficiency of their business procedures and ensure their competitiveness in a long-term level. In other words, digital transition of these firms leads to certain important achievements, such as the corporate development, the incorporation of innovative methods and the accomplishment of intelligent production. Furthermore, digital transformation plays a decisive role to the dynamic abilities of such entities and to the maximization of their entrepreneurial and innovative performance. On the one side, these new technologies contribute to the increase in the competitive capabilities of these enterprises, as these firms realize the value of their available resources, how to exploit them better and how these corporations can integrate the innovative tools in their operational processes and into their business approaches, so as to remain viable and competitive. On the other side, manufacturing companies upgrade their business activities through innovative technologies, such as artificial intelligence, which in turn enhance their corporate effectiveness. In other words, such firms utilize the modern and developed technologies in order to differentiate their existing goods, form new and upgraded products, which lead to the implementation of significant innovations, the expansion of market shares and to the development of new corporate models, which can optimize the maximum value, quality and competitiveness of these products. In contrast to multinational manufacturing enterprises, the manufacturing organisms in Greece must give more emphasis to the integration of digital transformation into their business strategies so as to maximize the value and the efficiency of these firms, as well as the effectiveness of the corporate operations and procedures, in order to increase their competitiveness at a national level, fostering new innovative methods and tactics (Zhang, Shi & Chen, 2021).

4. Results-Discussion

Digital technologies, tools and transformation have improved the effectiveness and operation of the automotive and manufacturing sector. More specifically, the examined manufacturing and automotive companies, such as Bosch, Toyota, Siemens and Tesla utilize connected systems, data analytics, Internet of Things systems, automated methods and artificial technology tools so as to boost their efficiency and their productivity, maintaining at the same time their competitiveness, increasing the sales and profit levels, as well as their consumer experiences.

Undoubtedly, digital transformation is crucial for the success, effectiveness and the acquirement of competitive advantage from the part of manufacturing companies. The integration of digital technologies and innovative methods into the strategies of manufacturing firms constitutes a moderator between digital transition and the obtainment of sustainable competitive advantage in the manufacturing market.

This means that digital transformation contributes to the increase in productivity for the manufacturing entities, the improvement and upgrading of their operational functions and automation procedures. This automation helps these organizations to produce more innovative and quality products that meet the demands of consumers.

Digital integration helps Bosch and Siemens to upgrade its operational processes and contributes to the adoption of digital business models. By fostering digital tools, such as artificial intelligence, these entities maintain their competitiveness and their leading position in the manufacturing sector.

Such strategy leads to the enhancement of the performance of the manufacturing corporations. Therefore, digital tools and techniques affect positively the strategic growth of manufacturing businesses and the digital transition of these companies forms a sustainable competitive advantage. In this way, these firms tend to be more profitable and possess a bigger market part in comparison with other competitive organisms in the manufacturing industry (Albukhitan, 2020).

In other words, in today's demanding and competitive digital era, these firms have integrated innovative technologies into their business models, strategies and into their

production procedures, in order to maintain their sustainable competitive advantage in the long-term. This means that the traditional and business approaches and processes have been replaced by new and pioneering technologies, with the aim to remain successful entities and increase their digital capabilities.

Digital transition affects in a positive way the automotive and manufacturing organization, which have incorporated modern and digital tools into the production of devices and vehicles and into their corporate functions. The main purpose is to optimize their efficiency, satisfy the consumer needs and expectations and maintain their leading positions and their brand name in the manufacturing and automotive sector.

This transformation includes the usage of connected systems and useful data and information about the experiences and demands of customers with the goal to increase production quality in manufacturing and automotive field. This means that these companies exploit the benefits of digital methods and technologies, in order to produce goods, that serve the targeted needs and personalized desires of consumers, following a customer-centric approach, offering to them a positive purchasing experience and forming with them long-term and loyal relations.

Especially for Tesla and Toyota Company, connectivity tools and developed driver systems intend especially to offer support and help to users, increase their convenience, their safety and their flexibility within the produced cars.

Digital transformation helps to a high degree the automotive firms especially to respond to the changes of the automotive market and the demands of possible consumers. By adopting and fostering new and innovative digital technologies, these companies have the significant opportunity to enhance their agility and maintain their innovative strategies, which contribute to the reformation of the transportation field.

The main and most important factors that influence the automotive and manufacturing companies to integrate digital technologies into their operations and corporate actions are various. The key factor however is the intense competition in these fields that urges these firms to expand their business activities into promising markets, to respond effectively to the demanding conditions of these markets, the increased needs of today's consumers and the huge diversification of goods. The diversification of

products has led to the implementation of new and unique business approaches, so as to produce distinguished products, responding to the rapid and evolving demands of customers for more innovative goods.

In the modern era indeed, digital tools and systems in devices and cars contribute to the increase in the total value of these produced goods. The incorporation of advanced software and hardware systems has enhanced not only the operation and the efficiency of these manufactured products, but also their complexity and reliability. Key factors that play a significant role in the development and growth of automotive companies, such as Tesla and Toyota are the driver connectivity, as well as the kind of driver based on its tendencies. Another important factor is autonomous driving, which gives the opportunity to the vehicle to navigate in heavy traffic conditions.

Digital transition has provoked crucial positive changes to the value chain by enhancing efficiencies, limiting production and operational costs, and creating more innovative products. Innovated vehicles and intelligent devices have transformed corporate tactics from promoting a good to providing increased value based on consumer experience and behavior. Also, digital transformation has affected in a positive way the supply chain of examined companies and this means that there is effective management of the whole procedure from the creation of a product until its distribution to the end customer. Moreover, digital technologies possess an important role, since advanced robots, artificial intelligence tools and the internet of things systems constitute nowadays an integral part of automotive and manufacturing entities.

As a consequence, the manufacturing and automotive corporations that possess a leading position in their sector, as these firms took the initiative and the responsibility to incorporate digital technologies into their production and business procedures have an important competitive advantage to dominate in the manufacturing and automotive industry. Thus, this means that these companies invest huge amounts of money on digital transformation and research and development issues, aiming at creating pioneering products, enhancing their profits, improving their productivity and maintaining their competitiveness and sustainability.

However, apart from the advantages of digital transition, the manufacturing and automotive entities have to face many serious challenges and risks. An important challenge is the difficulties and the obstacles in the incorporation of new digital technologies into their business strategies and procedures. Also, the effective management of data and information collected by the different sources, such as connected vehicles or supply chain constitutes a complex issue. Moreover, there is the risk of cyber attacks and for this reason the examined companies have invested huge sums of money for data protection. Furthermore, there is great difficulty in the production of personalized goods, that serve the personal needs and desires of the consumer public. Finally, the investigated firms have to pay excessive amounts of money in order to comply with the new and required regulations and strict rules, concerning the data safety and the safety standards (Drahokoupil, 2020).

4.1 Secondary Analysis of the Chosen Firms

Digital transformation is a vital determinant for the success and competitiveness of companies in manufacturing and automotive industry. Automation systems, advanced digital tools, artificial intelligence (AI), and the Internet of Things (IoT) companies like Siemens, Bosch, Tesla, and Toyota have helped organization to automate their operations and improve consumer engagement and product innovation. This chapter reviews the results of the secondary analysis for all of these firms, with a focus on what individual firms can discern from the case of each specific firm for its action response in digital transformation and the implications for sustainable competitive advantage.

4.1.1 Siemens

Firstly, Siemens is a multinational entity, that executes its corporate activities in the manufacturing field, specializing in the sector of digitalization and automation. This firm gives great importance to industrial automation, distributed energy resources, rail transportation and health technology systems, as well as to electrical devices for individuals mainly. Siemens constitutes a leading and successful industrial manufacturing entity at European level and possesses a prominent and distinguished position in the manufacturing market globally, characterized as leader in industrial automation and industrial software especially.

There is no doubt that Siemens has integrated advanced digital tools into its business model in order to remain competitive, incorporate new innovative methods, differentiate its products, satisfy customer demands and expectations, respond faster and in an effective way to market changes and conditions and maintain its leading position in the manufacturing sector.

This means that digital transformation helps this company to improve its operational and structural procedures and contributes to the disruption of its traditional corporate strategies, adopting and implementing innovative, more effective and new business models, which are based on digital technologies. By utilizing the real resources, such as factories with the digital tools, such as artificial intelligence, this corporation maintains its sustainability and its prominent position in the manufacturing market (Collis & Junker, 2017).

Though these new technologies, Siemens has the significant opportunity to upgrade its business functions and procedures, improve the experiences of consumers via the creation of targeted and innovative goods and foster new and developed corporate models.

More specifically, Siemens firm tries to implement a customer-centric strategy in order to respond to their preferences and tendencies (Badru, 2022).

Moreover, apart from its strategy, which relies on customer needs and trends, Siemens company tries in every way to realize market conditions, customer behaviors and actions, as well as competitive dynamics. There is no doubt that combining pricing strategy with digital tools enables this corporation to better serve consumer desires and enhance customer value.

For this reason, Siemens enterprise follows AI-Driven Pricing Analytics, in order to follow the best pricing policy, analyze historical information about past pricing tactics and adapt its pricing strategy to the existing market conditions.

Also, Siemens organization implements AI industrial strategy so as to enhance its productivity, limit its production and operational expenses, offer customized goods to customers, serve their needs, optimize manufacturing procedures and activities and improve the quality of its manufactured products (Ahmed & Wahed, 2020).

Furthermore, Siemens entity uses automation systems with the ultimate goal to develop cheap, specific, mass-produced goods and personalized to the wishes of the consumer public. Production systems and tools have an effective and fast operation in the creation of repetitive products at a high pace.

In other words, digitalization and the developed digital technologies, such as artificial intelligence, Internet of Things and digital twins provoke serious, positive and important changes and improvements, that lead to the adoption of more flexible and automation methods and procedures with an importantly limited engineering effort and cost (<https://www.siemens.com/global/en/company/innovation/research-development/siemens-core-technologies/future-of-automation.html>).

However, Siemens faces intense competition from other leading manufacturing companies, but it makes enormous efforts to maintain its market share, its technological superiority, its customer-centric strategy and its innovation approach in order to dominate in the competitive manufacturing industry. Also, another factor that plays a decisive role in the competitive advantage of Siemens entity is the differentiated portfolio of its products, which satisfies the needs and demands of the majority of consumers (Zhao, 2006).

Another key parameter that contributes to the establishment of this enterprise in the manufacturing market is its dedication to cybersecurity. In the demanding digital era, cybersecurity must constitute a significant priority especially to the manufacturing corporations and Siemens firm gives great importance and emphasis on the ultimate purpose to protect the data and its operation from cyber risks, obtaining in this way the strong reputation of a prominent entity in the manufacturing field (Shooter, 2020).

Siemens' long-term success is also attributed to its focus on sustainable innovation and talent cultivation (Ye, 2022). Since then, they have created an exceptional culture of continuous learning, positioning their workforce for upgrades in next-generation digital technologies. Siemens upgrades its talent through academic partnerships, as well as internal training programs that keep employees on the cutting edge of artificial intelligence, data science, and automation (Franco *et al.*, 2022). This approach to human capital not only strengthens internal talent, but also enhances the company's ability to pivot amid market disruptions. In addition, Siemens continues to lead in

sustainability initiatives by integrating environmentally friendly initiatives into its production processes as well as its products. Aligning digital transformation with environmental and social responsibility not only enables Siemens to achieve operational excellence, but also positions it to meet the demands of globalization. These initiatives solidify its position as an industry leader.

Additionally, another factor that has a significant influence on the acquirement of competitive advantage for Siemens organization is the effective adaptation of its corporate functions to the digital transformation, facing the difficulties, challenges and threats of the digital landscape and implementing digital strategies for its development, growth and for the increase in its operational and technological effectiveness (Cozmiuc, D. & Petrisor, I.I., 2018).

Siemens corporation provides a wide range of goods, that are technological innovated and advanced, from cyber security methods, digital consulting procedures, business processes and developed electrical appliances, that meet the expectations of individuals and enterprises, offering a competitive advantage, an outstanding position and a continuous success in the manufacturing field for this company (Cozmiuc, D. & Petrisor, I.I., 2018).

In addition to the above, Siemens firm has a strong global presence, which expands to more than 200 countries on a global basis and this advantage gives to this company the significant opportunity to develop their business activities into diverse and promising markets. For this reason, Siemens company has gained a strong and trusted corporate reputation for many years, due to its quality and innovative goods, services and digital solutions and because of its responsible commitment to the sustainable competitive advantage.

Finally, Siemens corporation strives to maintain a prevailing position in manufacturing branch, through the digital transformation and its advantages, which include the enhancement of business effectiveness and productivity. Additionally, the utilization of intelligent manufacturing systems and tools, as well as the integration of developed digital technologies, such as artificial intelligence, data analytics, internet of things and automation machines lead to the effective, fast and smart execution of manufacturing procedures for Siemens organization. Also, this company invests huge

amounts of money in technological advancements and in research and development issues, so as to differentiate its products and attract more consumers in the near future (FDA, 2023).

Siemens is a world-leading player in industrial automation and digitalization. Finally, the company has adopted digital transformation as a key pillar of the corporate strategy, utilizing advanced technologies to improve manufacturing processes and make its market more competitive. The use of AI-driven analytics, automation systems, and IoT solutions has enhanced Siemens' operational efficiencies and responsiveness to customer demand. With the inclusion of real-world manufacturing capabilities combined with the digital technology, Siemens has been able to improve their production cycles and product quality (Collis & Junker, 2017).

Customer-focused innovation is at the heart of Siemens' Digital Strategy. Utilising AI-Driven Pricing Analytics, the company personalises pricing strategies based on historical data, thereby facilitating a more dynamic response to market changes (Badru, 2022). Siemens has also adopted AI based industrial automation to improve productivity, decrease cost, and personalize its products offerings (Ahmed & Wahed, 2020). The increase in the use of automation technologies led to high field, high precision producing, also contributing to all corporate efficiency.

Another strategic priority for Siemens in the cybersecurity space. As digital threats multiply in the manufacturing sector, Siemens has heavily invested in strong cybersecurity measures to protect its data infrastructure and maintain customer and partner confidence (Shooter, 2020). In addition, the company's diversified portfolio of products from cyber security solutions, digital consulting services, and advanced industrial equipment has fortified its competitive edge in the global market (Cozmiuc & Petrisor, 2018).

4.1.2 Bosch

Bosch Company constitutes a multinational engineering and technology firm, which is based in Germany. This firm focuses on hardware and software applications, household appliances for individual consumers, industrial technology and on vehicle technology, as this enterprise is a leading automotive supplier globally.

The integration of digital transition into the business processes of Bosch firm means that there is improvement in the creation of innovative products, which respond in a successful manner to customers' needs and desires. So, digital transformation for this corporation includes mainly the changes for digital, connected products and connected industry.

More specifically, digitalization shift, which is fostered by the Bosch enterprise entails the adoption of its corporation strategy in order to be competitive, profitable, effective, productive, innovative and remain in the leading positions in the manufacturing market. For this reason, this entity produces at a fast pace its goods, in order to satisfy the expectations of demanding consumers, utilizes innovative methods and procedures for the production of such goods and is agile, so as to survive and be successful in dynamic, competitive and constantly changing manufacturing industry (Leiting, De Cuyper & Kauffmann, 2022).

Concerning connected products, in the context of digital transformation, Bosch organism has the tendency to develop smart and connected goods, that have many advantages in comparison with the traditional, conventional and outdated one, that provide limited value to customers. First of all, before promoting and advertising a good on the manufacturing market, Bosch company takes the initiative and responsibility to launch the skeletal good with its main characteristics. In this way, this firm has the significant opportunity and chance to evaluate and assess the market feedback and responsiveness and has the time to make important changes if needed. This strategy contributes to the development and the optimization of its features (Leiting, De Cuyper & Kauffmann, 2022).

Moreover, in today's digital era, the main design, operation and efficiency of produced goods must follow the demands of digital transformation. For this reason, Bosch company adopts a digital product engineering strategy aiming at incorporating digital solutions into the creation of its products, in order to satisfy the demands of the fast-evolving manufacturing sector. In other words, these products are launched into untouched and promising markets, attracting more new customers, developing more innovative corporate approaches, which lead to the creation of an increased revenue stream and leading to the expansion of business activities all over the world.

Thus, through the creation and formation of connected products, Bosch company is given the chance to take real time feedback from the manufacturing market and the existing customers about their features. As a consequence, Bosch firm can proceed to needed actions and procedures for the quality improvement of these products, so as to satisfy in a higher degree the consumer public.

Apart from the connected products, Bosch enterprise gives great emphasis on the connected industry and its value. This means that connected industry helps this firm to execute its corporate procedures in a more intelligent, effective and faster way. Via the automation processes, higher productivity, better response time to customer needs and quality improvement due to technological and digital advancements can be accomplished (Dattatri, 2022).

Given that connected systems constitute an integral part of daily life of people, since these devices make their life easier, Bosch company pays exceptional attention to Internet of Things methods, in order to realize better people's demands in the field of living, working and mobility. This strategy contributes to the adoption and implementation of effective, interactive and smart tactics that provide inspiring and concrete consumer experiences for its goods across different and various domains of everyday life.

In this way and with the exploitation of the benefits of the Internet of Things methods, Bosch firm has the chance to offer its customers more improved, advanced, developed and innovative products for the satisfaction of their demands. This means that this company has the opportunity to gather information, knowledge and data, in an anonymous manner, about the experiences of the existing customers from the usage of its connected devices. The purpose of this procedure is to create more targeted, personalized and user-friendly goods or services. To accomplish this goal, Bosch organization studies, investigates, analyzes and interprets these useful data. The vision of this firm is therefore to help foster more effective solutions that provoke increased value for final customers and users (Jung, Ferber, Cramer, Bronner & Wortmann, 2021).

Furthermore, Artificial Intelligent constitutes a key factor for the maintenance of its competitiveness and its sustainability in the manufacturing sector. This firm has

utilized AI-based goods and procedures for many years. Indeed, in 2020, Bosch corporation integrated valuable instructions for the usage and exploitation of artificial intelligence in the improvement of its products. The main purpose of this strategy is to develop smart, innovative and trustworthy goods, that have the ability to combine digitalization with corporate responsibility. Thus, this company gathers data and elements at different stages during various procedures, such as simulation or testing, in order to extract useful conclusions from these data aiming at improving its corporate functionality, its business performance and upgrading of the design and quality of Bosch goods and services.

Finally, except for artificial intelligence and Internet of Things systems, Bosch intends to utilize high-quality and digital technologies and tools, in order to produce superior and differentiated products in the manufacturing industry, which improve the daily life of consumers. These innovative goods contribute to the achievement of competitive advantage and the maintenance of its outstanding position in the manufacturing market on an international basis. For these main and significant reasons, Bosch firm strives constantly to remain successful, following a diversified, effective and innovative business approach. Additionally, this company tends to invest huge amounts of money on research and development topics and adopt a consumer-centric strategy, with the goal to meet the expectations and preferences of customers (Dattatri, 2022).

In addition to strengthening its digital capabilities and connected solutions, Bosch is anchoring its vision in human resource development and environmental protection to continuously drive its digital progress (Bosch.IO GmbH, 2023). The organization maintains a consistent reinvestment channel for improving skills by providing targeted training programs on artificial intelligence, IoT, data analytics, and more. Such programs keep Bosch agile, investing in the kind of mindset needed to meet future technological challenges. Bosch combines its manufacturing strategy with sustainability practices: by reducing emissions, saving energy, and creating green products. This dual commitment—to people and the planet—reflects Bosch's corporate philosophy that digitalization can only be successful if it is reconciled with social and environmental sustainability. The values are among those promoted by Bosch to consolidate a global reputation and ensure sustainable success in its

misaligned parallel competitive orders. By aligning digitalization and responsible innovation, Bosch has remained a key global player as both a technology leader and a sustainable manufacturer on the world stage.

Bosch is a global engineering and technology company, and is among the world's largest suppliers of components and systems for manufacturing and automotive technologies and continues to deliver leading edge digital and connected solutions to its customers. The company's digital transformation strategy is built on the creation of smart connected products and digital-operational manufacturing systems. Bosch has been able to deploy IoT technologies and AI-powered analytics into its production processes, thus making them even more efficient, while also improving customer interactions (Leiting, De Cuyper & Kauffmann, 2022).

A very relevant digital strategy of Bosch is its commitment to connected industry solutions. The company uses real-time data analytics and automation technologies for production(maximization of production efficiency) and quality control (Dattatri, 2022). This is how Bosch uses Artificial Intelligence and IoT in its manufacturing systems. Moreover, Bosch has leveraged IoT-based predictive maintenance to enhance operational reliability and minimize downtime in its production lines.

Bosch's digital strategy heavily emphasizes cybersecurity and data-driven decision-making as well. Using AI-based analytics, the company gathers and analyzes data from the connected devices to predict market behavior and consumer needs (Jung et al., 2021).

4.1.3 Tesla

Tesla constitutes a quite distinguished and famous multinational automotive firm. Tesla focuses mainly on the development, production and promotion of battery electric vehicles.

Digital transformation definitely impacts the whole manufacturing industry, since the creation of new innovative products contributes to the reconstruction of the traditional automotive corporate approaches (Marginalia, 2017). Also, enterprises, such as Tesla, focus mostly on connected cars, autonomous driving systems, mobility systems and competitive tactics through different technological advancements (Marginalia, 2017).

Moreover, several business activities are executed through online platforms and for this reason Tesla Company gives great emphasis on the customer behavior before the consumers decide to purchase the product they desire. This means that the website of Tesla corporation attracts the consumer's attention and the information offered affects to a significant degree the purchasing decision of its customers.

Therefore, there are important indicators that the incorporation of digital technologies into Tesla's business model is based on the utilization and exploitation of advanced digital platforms, different social media platforms and on the devotion and commitment of this company to offer a quality and superior customer service (Cohlab, 2015). In other words, Tesla entity is gradually and constantly developing and incorporating useful and valuable market knowledge (Rimmer, 2014).

Furthermore, Tesla is a prominent organization in the manufacturing industry that relies heavily on the information collected via the advanced and developed car sensors. Through this valuable contribution of data gathered, Tesla offers main and crucial assistance to its customers. Its major feature of being hyperaware offers Tesla a significant benefit over its rivals and gives it the opportunity to provide more personalized and targeted consumer experience. Hyperawareness helps decisively in the further development of this company. The main digital technologies that are being utilized in Tesla Company are the following:

- Tesla's Design Studio. Particularly, Tesla offers a useful online system on its official website that gives the opportunity to potential consumers to design their potential car. This procedure makes a significant difference to the better realization of the needs, preferences and expectations of its customers. Also, this process allows the company to design and improve the upcoming vehicle models according to the needs and desires of its consumer public (Garg, 2018).
- Big Data Analytics. This entity receives feedback on a frequent basis from the consumers, aiming at understanding better the market conditions and the demands of the customers. As a result, big data analytics allows the organization to extract useful conclusions from consumer's comments of the online platforms, perceive their common needs and take more effective and data-informed business decisions (Singh, 2021).
- Data-informed corporate decisions are required for the better operation of the firm, the more effective incorporation of digital transformation into business

models and the more efficient automation of the manufactured cars. Technological conditions are changing rapidly on an international level and the rivals of Tesla corporation strive to use innovative and upgraded digital technologies with the ultimate purpose to excel over this leading company. In such a condition, this company responds by becoming aware of customer needs and making appropriate decisions to satisfy these demands, even of the most demanding consumers.

- Autonomous Driving. Tesla company collects valuable data and information via vehicle's sensors in order to help users in driving. This firm utilizes elements and smart machine algorithms in order to inform drivers of other cars existence. In this way, this enterprise offers remote help and support to the consumers and this procedure gives the entity the chance to provide information to customers concerning their car's condition (Singh, 2021).
- Social Media Analysis. The firm is able to realize the consumers' preferences, trends and behaviors through this beneficial analysis. Furthermore, this strategy enables this manufacturing organization to detect the weaknesses and points that have to be improved and optimized in comparison to other similar automotive companies. As a consequence, this organism uses Artificial Intelligence systems that contribute to the better implementation of social media analysis and the adoption of digital procedures that may help these tools distinguish the necessary data, analyze it and make meaningful conclusions concerning the possible improvements in the products in the future, according to the gathered data.
- Fast Decision-Making. This process can only be implemented by robotic procedures, automation systems and helpful digital technologies. These robotic procedures utilized by Tesla Company enable this firm to enhance its production time and quality and receive effective and immediate business decisions, which align with consumers' needs and expectations.
- Robotic automation systems. These systems help this firm to produce vehicles at a faster and more effective pace, with the contribution of these robots, in order to face successfully the production difficulties (Debord, 2016).
- Additionally to the above, digital collaboration systems have significant importance and value for the process of digital transition. The context of manufacturing and automotive industry is evolving continuously and there is a

demand for advanced digital tools, which contribute to a high degree to the enhancement of the collaboration among the employees in Tesla company. The specific entity arranges these systems so as to help workers in working from distance. Also, these tools enable such employees in Tesla firm to work on same working actions from various places and form an innovative context that boosts significantly the firm's productivity, operation and efficiency.

Along with technology innovations, sustainability and nurturance of human resource are fundamental aspects of digital transformation journey for Tesla. With sustainable materials, energy-efficient gigafactories powered by renewable energy, and lots more, the company embeds green practices throughout its overall manufacturing and product lifecycle. These initiatives are in line with Tesla at large working to accelerate the world towards Sustainable Energy (Maradin, Malnar and Kaštelan, 2022). At the same time, Tesla's unique internal innovation strategy, employee investment in AI and automation training and experimentation and agility driven culture keeps the second area flourishing in terms of full-time workforce, as well. Such human-centric strategies enable Tesla to remain on top of technological advancements while adjusting to rapid shifts in the industry. The combination of cutting-edge digital tools and a fluid organizational culture not only speeds up Tesla's innovation cycle, but also solidifies its long-term competitive advantage within the automotive and clean energy markets.

So, Tesla organization faces in a successful manner the production challenges and gives great emphasis on the direct and constructive cooperation between workers, in order to execute their duties in higher productivity, zeal and with less obstacles. In this way, this company follows a more efficient tactic that enables the production stream to respond to the demand and supply (Needle, 2022).

The firm's digital transformation strategy is centered around connected vehicles, autonomous driving technologies, and AI-based data analytical techniques. This is heavily fed by digital platform and big data analytical technology investment by Tesla to improve customer experience and vehicle performance (Singh, 2021). This explains how Tesla's heavy dependence on AI-based data collection has drastically enhanced its product innovation and improved market adaptability. Utilizing state-of-the-art sensor technology and self-driving features, Tesla cars can

collect real-time driving data, enabling the company to improve driving safety and efficiency (Garg, 2018). Moreover, it uses data from its online platforms and social media to monitor consumer preferences and react quickly to changes in the market.

Robotic automation also has been a key factor enabling Tesla's manufacturing success. With the evolution of robotic systems, the convenience of growth has been achieved in almost any industry. Through its use of digital collaboration tools, Tesla bolstered employee coordination and remote oversight (Needle, 2022). These innovations position Tesla in the 1st in the digital transformation of the automotive industry.

Finally, all the aforementioned factors lead to the competitive advantage for Tesla organism, maintaining its dominant position in the automotive sector, remaining innovative and pioneering, introducing new innovative production methods and detecting new solutions for the improvement and upgrading of future vehicles and outperforming over other competitors in the long-term (Zhang, 2022).

4.1.4 Toyota

Toyota Company constitutes a Japanese multinational automotive firm, which is headquartered in Japan. It has characterized as a leading, successful and prominent enterprise in the automotive industry globally, manufacturing more than 10 million cars on an annual basis.

In today's demanding automotive landscape, Toyota firm has integrated digital tools into its business models and manufacturing actions and procedures, in order to remain competitive and innovative. In other words, the intense devotion of this corporation to digital technologies leads to the acquirement of a dominant position in the automotive market on an international basis (Moure, Lampón & Cabanelas, 2024).

For this reason, Toyota organization tends to realize in an effective way the demands of consumers and the conditions of automotive sector, market dynamics, utilize data analytics to obtain more information concerning the needs of customers and adopt advanced, flexible and developed manufacturing tools and procedures.

Also, Toyota uses and exploits the benefits of IoT-systems and tools to a high degree, such as sensors, in order to observe, supervise and gather useful data, about the customer experiences and needs, aiming at improving the weaknesses of the manufacturing procedures (Pourrahmani et.al, 2022).

Moreover, Toyota company gives great attention to big data, in order to improve quality control through real-time monitoring and optimize the management of its supply chain.

Furthermore, Toyota firm has incorporated Artificial Intelligence tools in order to maximize the efficiency of its manufacturing procedures, via the usage of robot-systems for the more efficient and faster vehicle production and the better monitoring of quality systems. These AI tools allow the detection of possible errors, defects, shortcomings and weaknesses during the production process and observe the effectiveness of manufacturing techniques and make improvements if needed (Marr, 2018).

Additionally, Toyota corporation utilizes Augmented and virtual reality experiences for the better interaction of digital tools with the real world. In this way, the employees of Toyota become familiar with the simulation procedure, workers are guided through a more effective management of difficult assembly actions and the production procedures are visualized before their implementation (Newman, 2019).

In addition to the above, Toyota enterprise uses advanced cloud systems and tools that allows the direct collaboration of various manufacturing units, the protection of data and the unlimited access to saved information for further analysis.

Toyota firm also utilizes collaborative robots for the better execution of mass production in a shorter production time. It also, uses digital twin approaches aiming at observing, analyzing, supervising and maximizing the efficiency of its manufacturing functions and processes. This gives the chance for virtual simulation, predictive methods and gradual improvements without influencing the real production stream (Marr, 2018).

The third pillar of Toyota's digital transformation is centered around the automaker's ethos of sustainability and human-centered innovation. It is also investing heavily in

eco-friendly technologies, including hydrogen fuel cell systems and methods for eco-efficient production with minimal emissions and waste. Toyota also values a continuous culture of learning for its workforce with training programs that focus on upskilling employees on the integration of AI, digital manufacturing systems, and automation processes. These initiatives are in line with the goals of global sustainability as well as Toyota's own efforts to remain an organization that can protect its insides operating and can quickly respond and adapt to the changes that disrupts the automotive industry. Toyota uses green innovation through digital tools to achieve product quality and brand reputation. In addition, its long-term partnerships with suppliers and academic institutions give it additional stimulation to that pipeline for innovation. This collective focus strengthens Toyota's commitment to global leadership in smart mobility and automotive digitalization and contributes to sustainable value for both customers and society at large (Gotoh, 2024).

From the above, we can conclude that Toyota's digital model will be improved, upgraded and developed even more in the future, incorporating into its business strategy other advanced technologies, such as edge computing and blockchain in order to improve to a greater extent its manufacturing procedures and operations, maintaining its promising picture in the automotive industry (<https://www.ineak.com/toyotas-digital-transformation-embracing-the-future/>).

Toyota company has a good brand reputation because it utilizes smart and digital methods in order to produce differentiated, reliable and innovative vehicles. This enterprise has a unique position in large-scale production of cars. This large-scale production gives Toyota corporation the important chance to produce the required amount at the appropriate time and limit the product expenses by utilizing firm and stable components and restricted working time. Moreover, Toyota organization gains competitive advantage against rivals, due to its differentiated and unique business model. Nevertheless, in order to implement effectively this corporate strategy, this automotive organism reviews and assesses its strategic and operational procedures so as to improve the weaknesses of its business tactics and processes.

In addition to the above business model, it is important to mention that Toyota Company focuses mainly on the high quality and customer feedback and the comments of consumers regarding their buying experiences, on its reliability and on

the upgrading of its production activities. However, Toyota firm strives a lot to maintain its leading position in the automotive industry and follows the above standards, in order to remain competitive and successful (Toma & Naruo, 2017).

More specifically, the first parameter that contributes to the success of Toyota company is its wide range of small vehicles, that this firm produces, because of the increased energy costs globally. Its rising sales of hybrid cars leads to the increase in the profit levels of this corporation. Another factor is the Toyota's reliability in the design and manufacture of these vehicles. The third key factor is the large market share that Toyota entity possesses, which helps this company to expand further its corporate activities in various countries and other promising markets. The fourth key factor is that Toyota organization provides and forms long-term business assets. The firm's quality and high production provoke positive brand value. This means that Toyota organism gives great importance to the vehicle creation, to the research and development issues of the upcoming cars, to its strong brand name and recognition, as well as to the long-term and trusted relationships with its main suppliers. The fifth main factor for Toyota entity is the advanced and evolving engineering for the production of innovative and reliable vehicles, that offer long-term and increased value to consumers (Ajila & Cruz, 2023).

The automotive industry continues to advance, and Toyota has adapted by incorporating various digital technologies in its manufacturing and business strategies to remain competitive. This strategy also encompasses the implementation of quality assurance systems based on artificial intelligence, monitoring of production processes through the Internet of Things, and decision-making procedures based on computational data (Pourrahmani et al., 2022). For this purpose, Toyota uses IoT-based sensor to collect the data in real time to gain information about the manufacturing efficiency. By doing this, the company is able to detect production weaknesses and resolve them, resulting in a higher quality product and low costs in production. Additionally, AI based predictive maintenance in Toyota has improved operational reliability while reducing the non-activity time (Marr, 2018).

One more important digital initiative of Toyota is employee training through augmented and virtual reality (AR/VR) tools and optimized production process feedback. These technologies enable seamless interaction between digital models and

real-world manufacture systems, increasing productivity and reducing potential errors (Newman, 2019). Cloud-based collaboration tools are used by Toyota to streamline supply chain management and improve data security. Lastly, through its focus on digital technology, Toyota has been able to run simulations of its production scenarios and use predictive analytics in order to improve its processes iteratively (Marr, 2018). So, Toyota's focus on hybrid and electric vehicle manufacturing is providing sustainable and tech-based movement (Toma & Naruo, 2017).

In conclusion, Toyota company follows an effective combination of business strategies, such as low-cost tactic, differentiation policy and the best cost approach, as well as the advanced digital strategy, in order to maintain its sustainable competitive advantage and be on the top of positions in the automotive field.

5. Conclusions

There is no doubt that the pervasive nature of digital transition in manufacturing and automotive companies has changed radically the way in which the products are created, promoted and delivered to the end customers. These entities strive to overcome and manage the difficulties, risks and challenges that are linked to the digitalization, in order to remain competitive. In this way, these firms increase their profit and sales levels, maintain their sustainable competitive advantage, hold their leading positions in the manufacturing and automotive industry and maintain their large market share.

In other words, these corporations invest huge amounts of money in digital technologies and tools, as well as in research and development in order to produce innovative and differentiated products, facing effectively the serious threats that are associated with digital transition. However, the rapid development of digital tools provokes many positive challenges for these firms, but causes many uncertainties for such businesses, that must be encountered. As a result, taking informed corporate decisions concerning the path of digital technologies and the implementation of innovation strategies constitutes mandatory step for the accomplishment of the success of these businesses in today's data-driven environment.

More specifically, digital transformation constitutes an important organizational shift, which is caused by the diffusion of digital tools. This radical change affects positively the corporate activities, procedures, and business models, as well as the management of supply chain. All these changes provoke significant improvements in the quality and innovation of produced goods, attracting more customers, serving their needs and enhancing their consumer experiences and in the automation of production procedures.

Also, digital transformation has a significant influence on the way that manufacturing and automotive entities operate and compete with other similar companies. This tactic includes the impact of digital technologies on the service and the quality of manufactured products, that satisfy the demands and expectations of the consumer public, increasing barriers to entry and enhancing the possibilities for the obtainment of competitive advantage for existing companies. So, the capability to utilize digital

technologies instead of traditional assets and methods has led to the acquirement of a sustainable competitive advantage for many enterprises in the manufacturing and automotive sector. Incorporation of digital technologies and adoption of innovative strategies and procedures contribute to the production of more effective goods, increase in productivity and effectiveness, and to the positioning of these entities towards a prominent and competitive position. Their products also offer increased value to consumers, who feel satisfied, as they cover their needs and desires. Therefore, digital transformation may be characterized as an important and integral part of a company's sustainability.

The incorporation of digital technologies decreases significantly the production costs, as well as the cost of detecting new market chances and helps in facing resource obstacles to expand the business activities. It also, enables the more direct and effective exchange of data and elements and the more constructive collaboration with suppliers and partners and gives the opportunity for the development of innovative and pioneering goods, which cover the demands and meet the preferences of customers. In order to produce these goods, firms in the manufacturing and automotive field focus on the integration of digital and automated systems, as well as on research and development issues, so as to offer unique value to consumers, which leads to the achievement of durable competitive advantage via strategic procedures.

These entities can enhance their operational efficiency by executing their business operations at a lower cost and by producing better and differentiated products. Big data, analytics, artificial intelligence tools and other digital and automated technologies, methods and processes enable these firms to produce their goods at a faster pace and in shorter time, increasing in this way the customer dedication to their brand name. Effective quality information and immediate responses to evolving changes in manufacturing field can contribute to better decision-making for manufacturing and automotive companies. This procedure helps the effective exchange of real-time data, the improvement of the corporate procedures, the reduction of production expenses and the immediate response to the needs of customers. The utilization of incorporated digital technologies leads undoubtedly to the establishment of agile manufacturing systems and to the achievement of greater levels of operational efficiency.

Digital transition facilitates the stream of data and gives the chance for better interactions with consumers and other partner companies, which enhance production and profits. Digital incorporation facilitates also the increased collaboration and the deeper knowledge of the operation of new technological systems on the part of all employees. The benefits of digital goods are significant and contribute to the creation of narrower, reliable and long-term relations with existing and possible consumers. In this way, the trust and commitment of customers towards the products of these companies increase and this leads to the acquisition of a competitive advantage gradually.

In the procedure of digital transition, companies are able to continuously upgrade their capability to transform their business procedures and improve the effectiveness of value-creating actions and processes within the manufacturing and automotive entities. These capabilities are beneficial for the creation of unique, differentiated and distinguished products, that lead to the acquirement of competitive benefits, because it is complicated to imitate such goods from the part of rivals.

Finally, the digital transformation is considered as the procedure of combining previous knowledge with new and improved knowledge about innovative methods and digital solutions, which leads to the success of manufacturing and automotive organizations, improving their competitiveness. Therefore, in most cases, these entities do not neglect their original goods, despite the adoption of digital integration. But, these firms try to ameliorate and upgrade their manufacturing and production processes and actions in order to improve their quality, innovation levels, as well as their functionality. Additionally, digital technologies and Internet of Things methods facilitate significantly the optimization and maximization of the efficiency of corporate activities.

In conclusion, manufacturing organisms and automotive companies, in order to normally adapt to the unstable environment and maintain their prominent positions in the industry and their sustainable competitive advantage, they strive constantly to remain innovative and adopt further digital solutions. Innovation through advanced digital propositions and improvements, such as big data, can offer opportunities to expansion into new and promising markets and for the increase in sales activities. Apart from the improvements in development and research, the expansion of business

activities, the comprehensive digital transition usually causes rapid changes in the whole value-creation approaches, as well as in the overall effectiveness of these businesses (Hughes et al., 2020).

6. References

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