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Future Challenges of Implementing Innovative Business Model in the Automotive Industry

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Abstract. *The innovative business model is implemented today in all industries. In the automotive industry, this model appears as a valid source of guidance in smart manufacturing, but also in the sales process, throughout the functional lifetime of a car. Using digital business processes opens new opportunities for innovation, from simple automation implementations to a fully automated assembly of a production line or a digitized sales flow.*

Specific objectives of this paper are based on the research of specialized literature regarding the implementation of business processes and the preparation of the environment for Industrial Revolution 6.0, by integrating innovations with major implementation challenges in the business model.

The purpose of this study is to identify if there is research on innovative business models or innovative processes in specialized literature.

Research questions are related to the terms associated with innovation such as an innovative business model, industrial revolutions, digital ecosystems, smart factories, or digital business processes. The research was carried out with the help of bibliometric analysis of scientific articles in Web of Science. Articles were analyzed in the VOSviewer application by identifying several clusters on key concepts. Innovative business studies in the automotive industry is a model that led to the creation of links maps between articles on the same topic, keywords, authors, in the last five years.

Connections between the concepts and processes used to implement the innovative business model, in different stages of the industrial revolution development are highlighted in this research.

Keywords: innovative business model, industrial revolution 6.0, digital ecosystem, smart factory, digital business process.

Introduction

A topic of interest for all entrepreneurs is using automation in business processes, facilities for the production and promoting of a car named business model, where platforms compete, especially when artificial intelligence is activated. But the biggest challenge comes up when the digital ecosystems in which run digital business processes are chosen, and the platforms begin to generate higher revenues than expenses (Böttcher et al., 2022).

All these depend on the activities carried out if they can be performed entirely electronically. In other words, the production process, the entire process of *creation, delivery, and service*, needs industrial robots to execute automations, and the sales process needs chatbots to communicate with the customer (Das and Pan, 2022).

Since it is based on an environment integrated with the requirements of the Industrial Revolution 4.0 (I4.0), the business model to produce passenger cars is validated when implementing the digitization of value chains (PwC, 2016). But the industrial revolution is a continuously developing process, through which manual work is replaced by automation (Xun et al., 2021).

A conclusive example is given by the promotion of a product, for example a car, with a view to selling on a platform where the customer -a *phygital* (physical and digital) *native*- is the

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one who chooses the configuration of the car and, moreover, can simulate a test in various environments. Currently we have metaverse AI (Kotler et al., 2023) or gamification, which provides this environment, and in the future, it is possible that augmented reality (AR) or virtual reality (VR) will be simulated to the environment where customers are at that time. The concepts of mixed reality (MR) (Das and Pan, 2022) and extended reality (XR) are brought to the fore, where AR and VR create a new environment through the interaction of reality with the environment generated by complex artificial intelligence or quantum computers.

Consequently, we are currently witnessing the preparation of the implementation of I6.0, where human intelligence joins with artificial intelligence in the sale of a car, after the production has been customized in an intelligent area (Das and Pan, 2022). This business model is one to be defined and outlined to produce a car and its sale, through intelligent systems.

In this context, the present research involves the investigation of articles from specialized literature, regarding the implementation of the business model in the industrial revolution 6.0 environment, in which the digital ecosystem is used. The research questions are formulated according to the future challenges in the implementation of a business model in the automotive industry, with validation in scientific papers published in Web of Science. Digital business processes run in smart factories are also investigated. The research questions are presented in specialist literature.

Literature review

Due to a radical change in all processes of business and implicitly in the production process or the sales process the innovative business appears, but especially the creation of digital values, due to digital transformations (Chourasia et al., 2022). All these transformations lead to the emergence of the business model on digital platforms (Bottcher et al., 2022).

The business model, from the automotive industry, suffers changes due to the emergence of digitized automated processes. Digital transformation complements the business model through application integration and exploitation internships (Khoshroo and Talari, 2022), but especially through attracting and retaining customers, generating secure income for the company, and carrying out digital activities (Khoshroo and Talari, 2022; Bottcher et al., 2022), following the production of passenger cars and their sale. The innovative business model consists of the value obtained from the profit and the stages by which it is achieved, the value transmitted to the customers and the value earned. In this case we need the market and related customers, product sales channels, product manufacturing resources and cost structure. These costs can be reduced by eliminating wastage of materials, raw materials, and human resources.

The innovative business model, compared to the traditional business model, comes with a series of requirements that ultimately lead to the optimization of resources in the intelligent factory based on automation and which has a significant reduction in costs. Thus, it can be stated that the requirements of a business model, in the case of smart factory production, require the use of artificial intelligence, industrial robots to ensure the automation of all processes, data analysis for making decisions based on concrete and fast values, as well as the Internet of Things, which provides links between decision and execution. However, not all the detailed components of the innovative business model are known and for this reason, after analyzing the bibliographic sources, the innovation requirements will be completed.

Therefore, research question number 1 is regarding the number of published documents that have described the innovative business model in which these requirements are presented.

The innovative business model initially developed in the industry 4.0 environment. This environment was based on the interconnectivity between people and machines and improves production processes leading to the emergence of new digital technologies, such as the digitized supply chain, but with an ecosystem with a sustainable performance (Shahatha Al-Mashhadani et al., 2021), through secure platforms and with certain customers.

From the survey carried out by PwC in 2016, where the automotive industry represented 9% of the total industries for which the study was carried out, it follows that a good part of the activities depends on the industry in which one works. Because digitized services are needed, but especially the presentation of products in a virtual environment, then the development of a strategy for the transformation into a digital enterprise, by updating the ecosystems in the digital ones, represent the future challenges of all employees, but especially of managers of any level.

In the automotive industry, an industry with many competitors, manufacturers are transforming factories into intelligent ones, in Industry 4.0 (Jerman, 2020). If, for this industry where human-machine interaction presents sustainability and resilience, robots, and machine learning, as well as other technologies, the ecosystem for I5.0 has been realized. Combining human and artificial intelligence, robots, using quantum computing and working with the human factor to process big data, as well as previously presented AR/VR/MR/XR, advanced artificial intelligence, IioT (Industrial internet of things) and digital twin, the ecosystem for I6.0 can be said to have been defined. We are witnessing in this period the identification of income and expenses with the help of artificial intelligence, and which lead to a fiscal evolution, where smart applications make their presence more and more (Duggal et al., 2021).

The major challenges in the implementation of the innovative business model reach a point of development where the need to implement megatrends appears, concepts that are continuously developing and that are part of I6.0, as presented by Forbes. It is possible that soon Generative AI will completely change the perception of the digital ecosystem. Bernard Marr presents in his new work that traditional AI is what we use now, and Generative AI brings a complete restructuring of today's innovative business models, through digital business processes executed simultaneously, according to the requirements of each customer.

The second question is closely related to the concept of industrial revolution and articles published by researchers that showed the stage of preparation and implementation of version 6.0.

We are in full development of the implementation of the digital ecosystem of I4.0. The idea of metaMarketing appears more and more and makes its presence known through physical and digital space interaction, under the name phygital, for the client who still does not completely abandon the traditional market (Kotler et al., 2023). Along with this innovation, there is also the idea of changing chatbots with personal agents, which using artificial intelligence, will offer us the desired product. These agents will lead to increased productivity, increased production, but at the same time there is a need for a factory to meet the demand. If in I4.0 we have chatbot, in I6.0 we will have the personal assistant of each client.

We are again witnessing the implementation of IoT, through a complex network of technologies and processes that tracks the production and sales process in a controlled environment. Digital manufacturing ecosystem is closely related to the concepts of business process, competitiveness, distribution, intelligence, connectivity (Shahatha Al-Mashhadani et al., 2021). Therefore, we have a digital business ecosystem in which all processes depend on each other, making up collaborative processes and in which digital innovation is also included.

Following the digital transformation, a few factors are highlighted by the inclusion of digital platforms, high-capacity infrastructures in the form of IoT, production automation and especially

how the smart factory includes digital twins. The latter is a concept that brings the simulation and optimization of production in various parameters, but also in the supply chain and that significantly reduces costs, ensuring products adapted to the needs of the customer.

The third research question is put under careful monitoring in the specialized literature, the works published for the digital ecosystem, necessary for the development of the innovative business model.

Smart factories come to the aid of the consumer, through the speed with which a car is produced. According to Philip Cooke, in 2021, the smart factory takes shape in the car manufacturing industry, especially in the factories of the companies producing the brands Audi, BMW, TESLA, Fiat, Peugeot, but also others. The situation in which the smart factory operates at full capacity is kept under control by quantum technology. I6.0, which is emerging as the basis of this ecosystem, is a collaboration between I4.0 and I5.0, developed (Das and Pan, 2022).

The emphasis on quality, but also on robots, leads to a collaborative way of automating production. But, rapid changes of production lines are still carried out by the human factor, in a short time of only a few days, while robots carry out such an implementation in weeks. The Alfa Romeo plant achieves such a change with employee support in three days, and with robots in five weeks (Cooke, 2021).

The factory of the future or smart factory has as its first characteristic the connectivity between digital components, but also with the human factor, it presents a flexible automation and integration of artificial intelligence (Chourasia et al., 2022). A smart factory model was made in Germany. The Aachen University of Applied Sciences has built a smart factory based on I4.0, with real success, for the production of e.GO cars, which works automatically with industrial robots and 5G connectivity, based on the digital action between the internet of things and industry, with the name of *industrial internet of things* (IioT).

Such a transformation into a smart factory (Cooke, 2021), with the implementation of the business model, is a key element to be studied in various digital ecosystems, from I4.0 to I6.0. Digital ecosystems bring people, business, and technology together with the aim of creating an innovative business. In this case, the concept of digital twin is an essential element in the verification and simulation of innovative processes before implementation.

The fourth research question is related to the articles identified regarding the smart factory, a fundamental transformation of the innovative business model for the efficient obtaining of a higher quality product.

Within the innovative business model, a series of processes are required, from the entire production process in the smart factory to the sales process, where the customer is omnipresent through the corrective actions he has regarding his needs (Cooke, 2021). Both the company and the customer are constantly connected and check how the business requirements are implemented. But it is necessary to check every digital business process. This presupposes the existence of some controls at the implementation of I6.0, in the innovative business model.

The fifth question is related to the number of articles published by authors in the presentation of innovative business processes, of the business model.

This paper brings to the fore a series of concepts related to the innovative business model, which ensures the preparation for I6.0. In the articles resulting from the research, several terms were presented, but no article specified training on working concepts, for the new requirements of I6.0. It is thus proposed to identify the key words, and check if the connection maps show connections between these concepts, necessary in the process of preparing the implementation of I6.0.

Methodology

The analysis of specialized literature consisted in the selection of articles searched on the Web of Science. These contained key terms such as an innovative business model, industrial revolution 6.0, digital ecosystem, smart factory, digital business process. Querying the Web of Science database was done by searching these terms, analyzing, and summarizing the results.

The bibliometric analysis was carried out both by topic and by combinations between search conditions such as a research area, authors, or a certain period, such as in the last five years (2020-2024). The searches of articles and scientific papers of the conferences, with the year of publication in this interval, were carried out in January 2024.

In the first unconditional search, on the basic terms used in the future innovative business, the results returned of the request showed a very large number of articles, for the innovative business model, Industrial revolution 6.0, smart factory, digital ecosystems, digital business process. To check the results, there were found other key concepts used to prepare the I6.0 environment in innovative business, namely: digital transformation, digital value, quantum computer.

Due to the high number of articles returned when searching for the terms it is necessary to present that a comparison was made between the second search without publication limits and the third search with five-year publication limits. An important search was carried out in the automotive industry, because it is the subject that takes precedence in this paper and for which it was highlighted separately in table no. 1.

Table 1. Keywords for bibliometric analysis

No.	Keywords	No. of articles written in an unlimited period of publishing	*Percentage*	No. of articles written in last five years of publishing	*Percentage*	*Automotive industry*
1	Innovative business model	6.440	19%	2.445	16%	17
2	Industrial revolution 6.0	589	1%	196	1%	4
3	Digital ecosystem	12.679	37%	4.870	31%	40
4	Smart factory	6.761	20%	4.008	25%	157
5	Digital business process	8.087	23%	4.343	27%	35
Total		***34.556***	***100%***	***15.862***	***100%***	***253***

Source: Author owns research in Web of Science.

There is a considerable difference between the two categories of searches, unlimited and over a period of five years, on each term. A weighting of the number of articles from the total number of works identified on each theme was carried out to establish the degree of coverage with specialized articles, which the searched words present. The most frequent topics are related to digital ecosystems and digital business processes.

The export of information from Web of Science was done on full records and citations, from the content of each article for the innovative business. Loading the results into VOSviewer, a software with a degree of analysis of many articles and processing them resulted in clusters through the connection of fundamental keywords for studying the domain and making linkage maps.

The starting point of the research defined by a series of concepts, identified in the specialized literature, being an intensively researched topic, especially in the last 5 years, if the implementation of I6.0 is desired, is related to the innovative business model.

Similar research, based on bibliometric analysis of articles resulting from Web of Science searches, exists for digital manufacturing ecosystem (Shahatha Al-Mashhadani et al., 2021), digital transformation strategy (Khoshroo and Talari, 2022), digital transformation, manufacturing, Industry 4.0 environment, (Machado et al., 2022), production, manufacturing, digital transformation, Industry 4.0, digitalization, and automation (Ahmi et al., 2024).

Results and discussions

Table 1 shows the total number of 15,862 research carried out, with documents published in Web of Science, on the terms innovative business model, industrial revolution 6.0, digital ecosystem, smart factory, digital business process, in the last five years and those that will be analyze further.

The first searches were made for the words Innovative Business Model, in Web of Science. The search result, with restriction on publications with research areas business economics, computer science, environmental sciences ecology, science technology other topics and totaled several 6,440 articles.

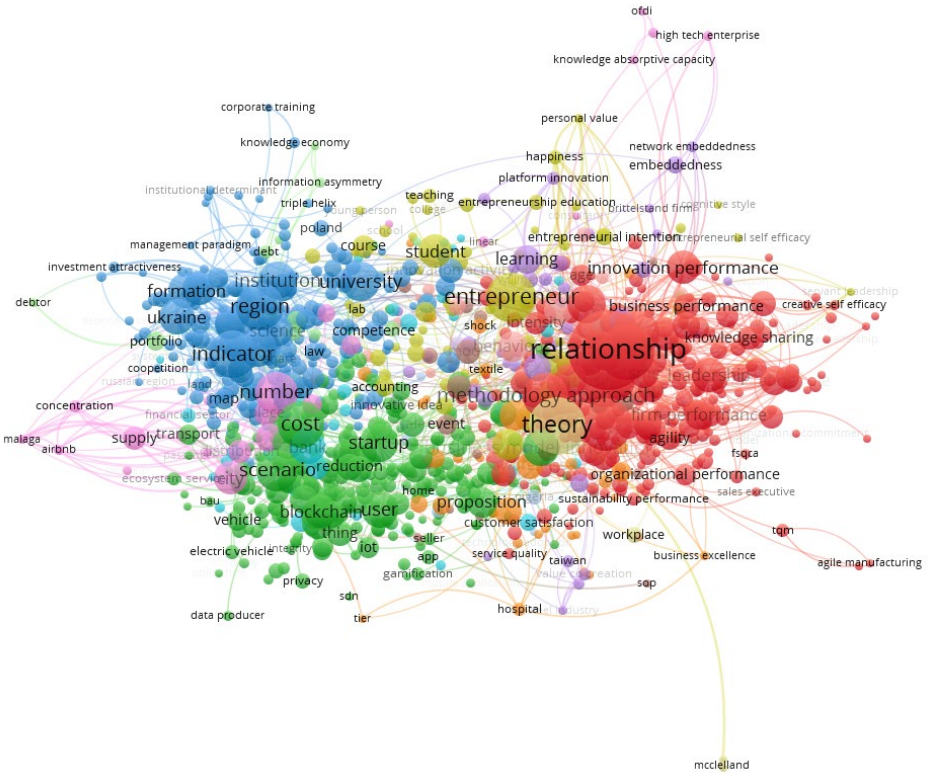

Figure 1. Network of Innovative Business Model

Source: Author owns map generated in VOSviewer.

The restriction to the last five years resulted in a result of 2,445 papers, which were analyzed in VoSviewer. Although only 17 papers have topics related to the automotive industry, it is important to analyze the links with all the fields in which research on the new model has been exemplified.

Generation of linkage maps was performed with VOSviewer, version 1.6.20. 1,079 articles were identified, with 14 clusters represented by different colors in the map, 92,411 links, total link strength 404,926, which means that business model innovation is an important factor in business research in the last five years.

The innovative business model is closely related to many other model determinants due to its relevance in use as well as the appearance of several items. Thus, the following were identified: outward foreign direct investment (7.86 relevance with 11 occurrences), employee motivation (4.99 relevance with 10 occurrences), innovation quality (4.93 relevance with 16 occurrences), agile manufacturing (3.60 relevance with 11 occurrences), platform innovation (3.30 relevance with 26 occurrence), data producer (2.97 relevance with 15 occurrence), collaborative network (2.96 relevance with 19 occurrence), firm innovation performance (2 relevance with 10 occurrence).

Outward Foreign Direct Investment has the greatest relevance because this factor supports the sustainable growth of a company over time by improving production and the logistics chain in the sales process (Shahatha Al-Mashhadani et al., 2021).

The visual analysis shows that terms such as employee motivation, innovation quality, agile manufacturing, platform innovation, data producer, collaborative network are addressed on a large scale, through a clearer representation of them in the articles returned from the search. Scenario, gamification, or cost in the green cluster are closely related to the aspects of the business model, such as innovation activity, innovation performance, firm performance, agility, located in the red cluster. This link shows the way of interaction within the innovative business model and implicitly its components, through the contribution they have in the new innovative model of production and sale of a car. It is identified in this model, in a form of connection between production and sale, the behavior of the consumer, but also the consultant, who participates in the creation of business value.

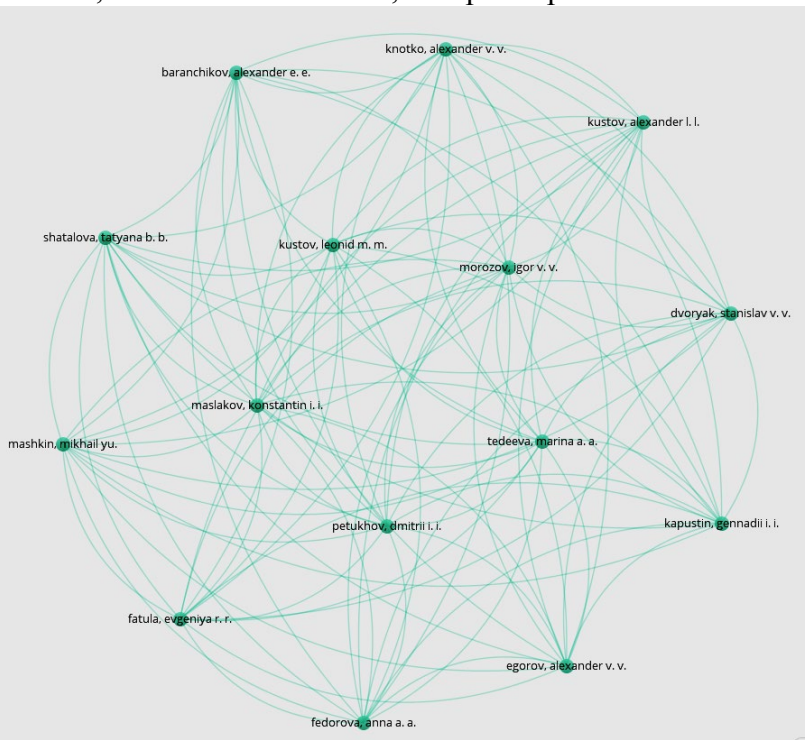

Figure 2. Map for Industry 6.0 researchers

Source: Author owns research in Web of Science.

The search on industrial revolution 6.0 did not show conclusive results, these being 4, for automotive industry, which highlights that it is still a topic that is at the beginning of research. Therefore, the searches were extended to Industry 6.0, for research areas such as: Engineering, Computer Science, Business Economics, Telecommunications, Automation Control Systems, Communication, Development Studies. They yielded 589 articles and refining the output over five years yielded 196 articles, extracted for VoSviewer analysis. The realization of the link map on co-authorship led to the visualization of a single cluster with 105 links and the identification of 15 authors, studying the implementation on version 6.0 (figure 2).

The relevant factors in the papers studied are optimization, performance, and strategy.

Researchers distinguish between the concept of industrial revolution 6.0 and Industry 6.0. The links between the articles published by the researchers, as shown in Figure 2, are almost identical for each of the 15 authors, concluding with the idea that the 6.0 industrial revolution has begun, and artificial intelligence is complementing human intelligence.

From the point of view of optimization, it can be said that if in the industrial revolution phase 4.0 IoT plays an important role by connecting all industry equipment at the Internet level, in I6.0 the intelligent factory with autonomous digital processes appears. These types of processes lead to advanced technology requirements through AR/VR/MR/XR uses and data analysis through a sustainable and human-centered manufacturing system.

In I6.0, it is identified in published research flexibility and adaptability to different types of production demanded by the increasingly customized market, centered on customer requirements, with technological anticipation, strategies to protect sensitive data and collaboration between man and machine at another level.

Refinements in the search were performed in Web of Science Research Areas for the term *digital ecosystem* and resulted in results according to the Funnel chart, which is a type of graph with progressively decreasing proportions, representative of the search process, made in MS Excel. A total number of results of 12,679, with 4870 papers, over the last five years, of which 40 papers in the automotive industry were identified for the digital ecosystem.

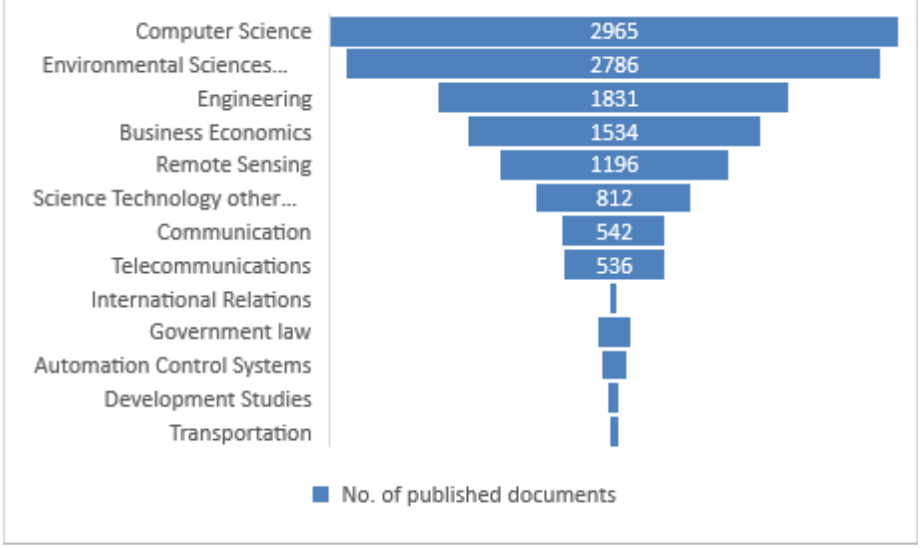

Figure 3. Number of articles by representative categories

Source: Author owns research in Web of Science Categories.

Research related to the *digital ecosystem* has a decreasing trend, as highlighted in figure 4. As a comparative term, 2024 is still early, but 2023 compared to 2022 has a slight decrease. This is because there is a major emphasis on I6.0 and less on the environment in which it is deployed.

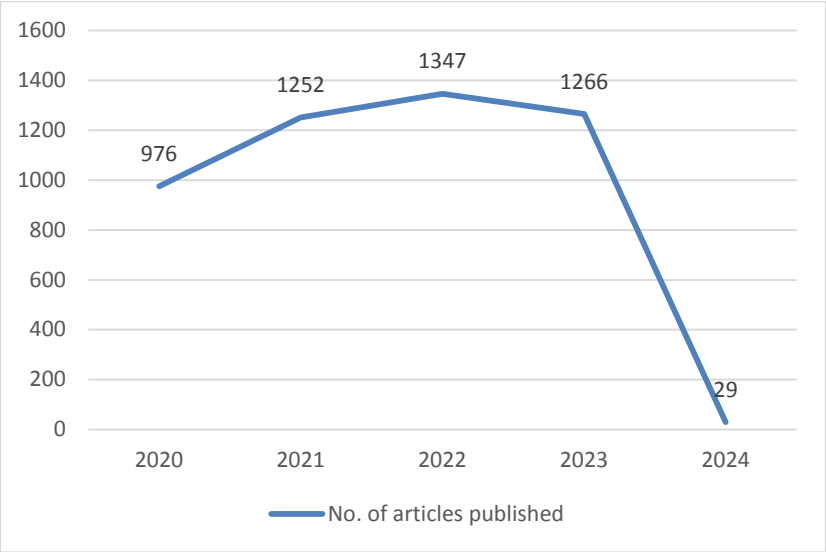

Figure 4. Number of articles for digital ecosystem, by last five years

Source: Author owns research in Web of Science Publication Years.

From the bibliometric analysis with VoSviewer it resulted that two clusters were formed with 1474 items with links totaling 223933 nodes and total link strength of 571887. The keywords found were internet, blockchain ecosystem, innovation, smart device, platformization, actors, business model, digital transformation, transaction, intelligence, IoT ecosystem, software ecosystem, communication, ecosystem management and they are representative of large nodes.

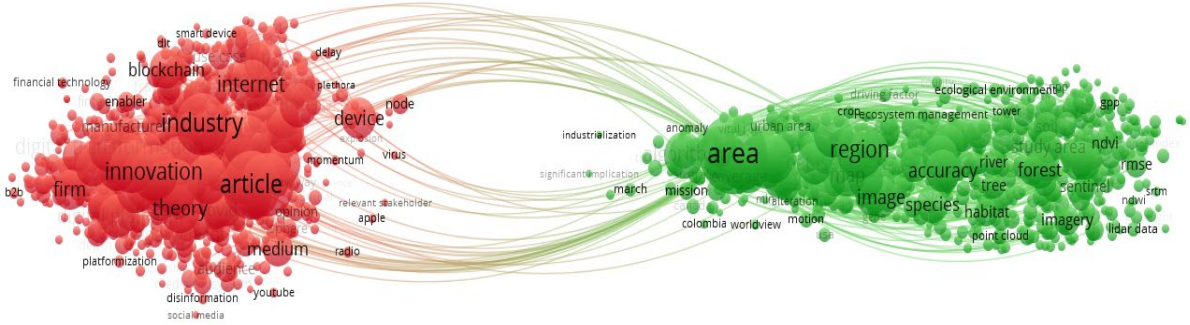

Figure 5. Number of articles for digital ecosystem, by last five years

Source: Author owns research in Web of Science Publication Years.

The two clusters show the connection between the innovative business model using digital business processes, in an environment where customers, resources, rapid adaptation to new demands and digital process transformations can be identified.

The distance between two concepts indicates the connection between them. If at the internal level of the red cluster the association between innovation, internet, blockchain, industry is identified, not the same conclusion can be noted between the two clusters. The distance between them is significant, which indicates that although there are links between them, they do not have a

major impact and more, it shows a link with the overall ecosystem environment. The digital peculiarity appears only in the red cluster, where digital transformation is also present.

Figure 6 shows the connection map for the *smart factory*. Its construction resulted in 6 clusters, 1224 items, 98653 links and 364969 total link strength. The most representative nodes are given by the words: concept, robot, quality, detection, accuracy, plant/factory, industrial internet, human worker, channel, communication, standard, protocol, blockchain and others. Some nodes have been identified in scientific papers from the literature review, such as robots or industrial internet of things.

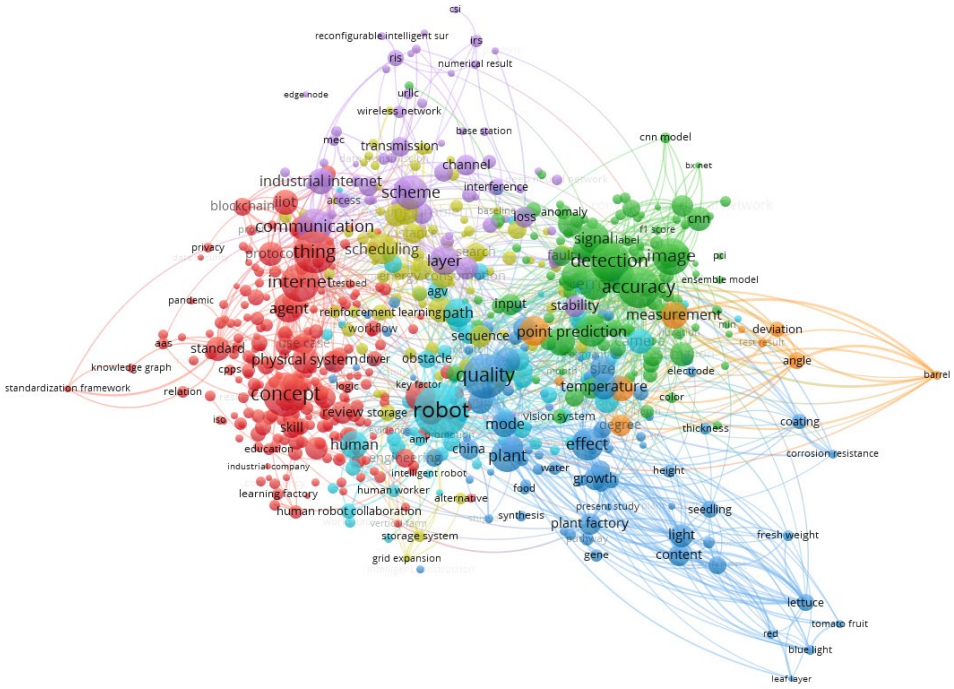

Figure 6. Number of articles by last five years, for smart factory

Source: Author owns research in Web of Science Publication Years.

Smart factory presents flexible production, self-adaptation to emerging conditions, with the simultaneous management of several automated processes (Cooke, 2021). Deloitte stated as early as 2019 that people remain the key to operations, and that the smart factory cannot turn into a factory where only robots work. The concept of a digital twin appears in the smart factory in the automotive industry to achieve modified ecosystem conditions, in which a prototype of a car runs (Cooke, 2021), before the realization of a series of finished products.

The innovative business model for the smart factory brings to the fore the identification of objectives for the creation of new environmentally friendly cars, new services for their promotion and sale. The digital ecosystem brings new advanced technologies by integrating artificial intelligence and personalizing customer needs. This model appears as a valid source in smart manufacturing, but also in the sales process, throughout the functional life of a car, where the industrial robot or the software robot is the one that ensures the whole process.

Smart factory, an innovation in sales brings to the fore a more efficient storage of products, depending on market demand and above all timely delivery, according to the customizations requested by the customer. The quality is clearly superior to these products, thanks to the control automatisms in the production flow, but also a flexibility of the sales process.

Through this transformation of a factory into a smart factory, various stages of production and interconnectivity between the manufacturing company, sales and the demanding customer can be provided in real time.

The next search was carried out for digital business processes, for which several 8087 papers resulted, of which 4343 for five years, and 35 on the automotive industry. The greatest relevance is digital technique with 5.99, digital process innovation with 4.67, digital collaboration with 4.32, green innovation with 3.85 which also has the largest number of 38 occurrences. The main nodes in this map are firm, digital economy, quality, blockchain, economic growth, digital twin, stakeholder, entrepreneur, and others.

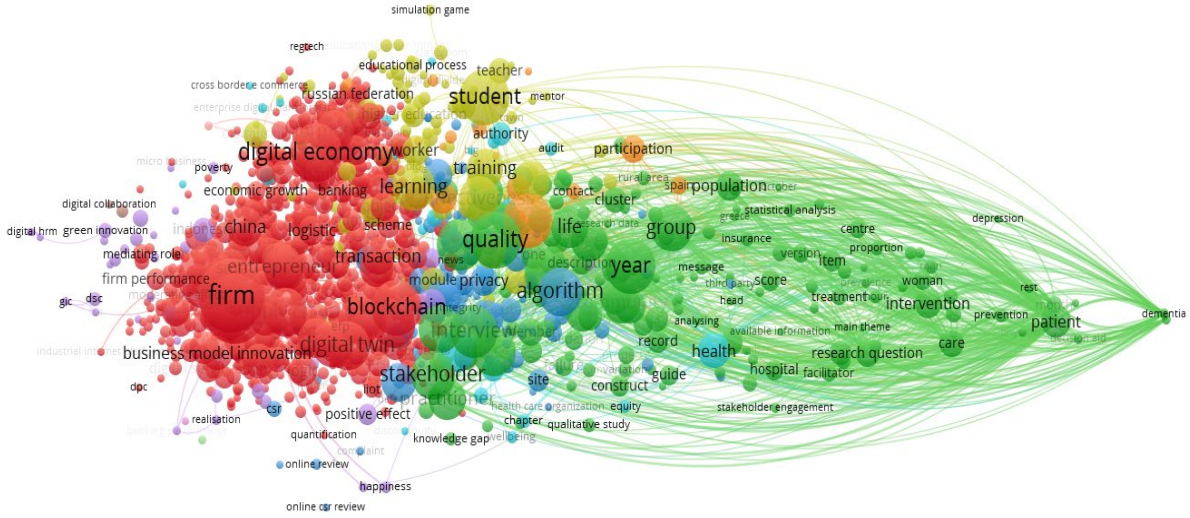

Figure 7. Number of articles by last five years, for digital business process

Source: Author owns research in Web of Science Publication Years.

From the link maps made on the presented nodes, a series of concepts can be highlighted, which can also be found in the specialized literature selected in the references. Thus, the digital economy appears in close connection with the innovative business model, being in the same red cluster with several other factors.

Among them are economic growth, firm performance, Enterprise Resource Planning (ERP), supply chain and digital twin, which also appears in this map. It is obvious that a key concept in the implementation of the business model in the smart factory is the digital twin.

Table 2 represents the synthesis of the Web of Science searches, with all the main nodes from the VOSviewer analyses, of the five keywords. Although they are not in the same search, there are common words and nodes in the five searches, that is, they can be associated to describe the innovative business model. The words identified in the maps, located on column 3 of table 2, are also partially or fully found in the articles specified in column 4, making a correlation and validation in previous studies.

Table 2. Keywords for innovative business model

No.	Keywords	Main nodes in VOSviewer research	Impact	Justification in articles
1	Innovative business model	outward foreign direct investment, employee motivation, innovation quality, agile manufacturing, platform innovation, data producer, collaborative network, firm innovation performance	3. Monitoring of business processes	(Chourasia et al., 2023) (Bottcher et al., 2022) (Machado et al., 2022) (Khoshroo and Talari, 2022) (Shahatha Al-Mashhadani et al., 2021) (Duggal et al., 2021)
2	Industrial revolution 6.0 (preparing I6.0)	Industry, optimizare, performanță și strategie	2. Implementation of requirements I6.0	(Chourasia et al., 2023) (Machado et al., 2022) (Khoshroo and Talari, 2022) (Shahatha Al-Mashhadani et al., 2021) (Ahmi et al.,2019) (Das and Pan, 2022) (Xun et al., 2021) (Duggal et al., 2021) (Grabowska et al., 2021)
3	Digital ecosystem	internet, blockchain ecosystem, innovation, smart device, platformization, actors, business model, digital transformation, transaction, intelligence, IoT ecosystem, software ecosystem, communication, ecosystem management.	1. Preparing the I6.0 implementation environment	(Chourasia et al., 2023) (Bottcher et al., 2022) (Khoshroo and Talari, 2022) (Shahatha Al-Mashhadani et al., 2021) (Duggal et al., 2021)
4	Smart factory	concept, robot, quality, detection, accuracy, plant/factory, industrial internet, human worker, channel, communication, standard, protocol, blockchain, quantum computer	5. Integration of points 1 to 4	(Chourasia et al., 2023) (Machado et al., 2022) (Khoshroo and Talari, 2022) (Ahmi et al.,2019) (Das and Pan, 2022) (Jerman et al., 2020) (Grabowska et al., 2021)
5	Digital business process	firm, digital economy, quality, blockchain, economic growth, digital twin, stakeholder, entrepreneur	4. Digital process of the business model	(Machado et al., 2022) (Khoshroo and Talari, 2022) (Shahatha Al-Mashhadani et al., 2021) (Cooke, 2021)

Source: Author owns research from VOSviewer results.

Table 2 shows that the most important step is the preparation of the 6.0 implementation environment, followed by the implementation of the requirements of the 6.0 industrial revolution in the innovative business model through a series of digital business processes to develop a smart factory.

The innovative business model is an intensively researched topic, especially in the last 5 years. In I6.0 this model changes majorly, when talking about the correlation between human intelligence and artificial intelligence, when business processes are realized through digital twin implementation and when advanced technology achieves unprecedented performance through quantum computers.

By identifying in table 1 the number of works, in conjunction with table 2 in which the words from the connection maps were identified, it follows that the model thus constituted is one that prepares I6.0. By searching according to certain criteria, questions were answered regarding the

establishment of several documents published on the terms innovative business model, industrial revolution 6.0, digital ecosystem, smart factory, digital business process, in the last five years.

Moreover, through the synthesis in table 2, concepts associated with the keywords in this paper were also highlighted, being the answer to question 3. The most important words identified in the link maps are digital transformation, digital twin, and quantum computer.

The author's contribution is to identify the key concepts for the innovative business model and to present them in the order in which they populate the model. In the articles resulting from the research, a few terms were presented, but no article specified the verification that the link maps show connections between these concepts, necessary in the process of preparing for the implementation of I6.0.

The concepts were validated in the specialized literature and similar studies related to the digital manufacturing ecosystem based on business processes were identified (Shahatha Al-Mashhadani et al., 2021), business logic and value creation processes end up being modified in digital transformation (Khoshroo and Talari, 2022), with methods and tools used in easy and strategic management – innovative with digital transformation and Industry 4.0. (Machado et al., 2022). IioT has a very important role in manufacturing, when digital transformation takes place (Ahmi et al., 2024) and automation in the smart factory reduces production costs.

Conclusion

The link between the keywords was shown through bibliometric analysis, and these concepts define and interact with the innovative business model. Future opportunities for digital business process integration are being pursued for a smart factory, which prepares its digital ecosystems, to implement the requirements of the 6.0 industrial revolution.

The keywords searched in the specialized literature through Web of Sciences were loaded into VOSviewer along with the title, abstract, authors, even complete articles, in the case of the business model based on innovation. The drawing up of the link maps between the link nodes (key concepts) led to a synthesis of them and the expression of the conditions under which RI6.0 will develop.

The preparation of I6.0 on stages of digital transformation of business processes, the main objective of this research, was carried out by identifying the basic concepts, the links between the articles and the environment called the digital ecosystem that highlights the smart factory in the automotive industry. This industry is the most competitive in terms of advanced technologies and has as its first objective the development of new prototypes, with the help of gamification, identified now of interconnection of key concepts. The sales process becomes an innovative one, as the author Kotler also stated in his latest work, the sales agent in I6.0 being a virtual one, transformed from today's chatbot. In conclusion, the innovative business model achieves performance at unprecedented values.

The author's contribution to this research brings the presentation of the integration of key concepts in different contexts of the implementation of the innovative business model, in the preparation of the environment for the Industrial Revolution 6.0, through the integration of digital ecosystems in the smart factory and digital business processes.

The analysis was limited to five years due to the large number of research papers and the extraction tools of the Web of Science database, with reduced terms and conditions of analysis as facilities of this platform.

During Web of Science searches, digital transformation, digital twin, and quantum computer were identified, which are part of the ecosystem modification and implementation process in I6.0 and require future research.

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