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Managing the Transition Process to Society 5.0

DOI: 10.7595/management.fon.2023.0017

Abstract:

Research Question: In this paper, the processes that characterize the transition process to Society 5.0 are analysed. **Motivation:** The wide application of Industry 4.0 technologies has positively affected the economic aspects of conducting business. However, issues arise in the social and ecological aspects. Overcoming these challenges is not an easy task for both enterprises and countries as well. Multiple processes across multiple industries take place that pave the way towards a new business and social paradigm – Society 5.0. The main goal was to determine what processes characterize the transition to Society 5.0 and how managing some of these processes can affect the transition. Additionally, the role of managers in Society 5.0 is discussed. This is important, as the number of studies that address this subject in this manner is small. The motivation is to expand the existing body of literature in this domain. **Idea:** The main idea was to conduct a systematic review of studies regarding Society 5.0 from various aspects. Based on the findings, the role of managers is investigated. In addition, a theoretical model of the transition process is developed. **Data:** For this review study, 54 papers from credible sources were qualitatively analysed. The papers refer to Society 5.0 in various domains (sustainability, business, environment, ICTs, education, technology, data, Industry 4.0, Industry 5.0 etc.). **Tools:** The well-established PRISMA protocol was used for the review process. The findings were noted and labelled for easier development of the theoretical model. **Findings:** The findings and the developed model indicate the imperative role of managers across all industries for organic and sustainable results that come from the transition processes. Managers must embrace change and thrive towards the concept of Society 5.0 when it comes to conducting business. **Contribution:** The results of the review contribute to the existing body of literature, as there are few studies that address Society 5.0 in this manner.

Keywords: Society 5.0, modern management, transition, process, Industry 4.0, business

JEL Classification: L21, L23, L26, L60, M10, O31, O35, O36

1. Introduction

In the modern business environment, enterprises are focused mainly on the economic aspect of conducting business. The application of advanced technologies that characterize the fourth industrial revolution – Industry 4.0 positively affects business performance but its effect on the social aspect of conducting business is negative. This approach is not sustainable as there is no balance between social, economic, ecologic, and political aspects of modern business. These challenges of modern technology application are present across countries and industries. In January 2016, the Government of Japan presented the concept of "Society 5.0" as a vision of human existence, where technology is applied with the goal of human prosperity and well-being in focus (Bruno, 2018; Mavrodieva & Shaw, 2020). The focus of Society 5.0 is on human beings and their quality of life (Eze, 2021). The idea is to place man at the centre of innovation, technological transformation, and industrial automation (Pereira et al., 2020). The emphasis is not on progress, but on the use of technology for the benefit of individuals (Kurniawan et al., 2019). In Society 5.0, technology is becoming part of humanity (Ellitan & Anatan, 2019). Society 5.0 aims at integrating processes within intellectual, real, and virtual worlds through the application of information and communication technology. Furthermore, industrial revolutions are noted as significant events of humankind development, and as such include a wide array of changes on a technological and social levels. The technologies that have marked Industry 4.0 have resulted in better product quality, higher productivity, improved working conditions and

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safer decisions. However, Industry 4.0 has also brought challenges to enterprises, and a basic approach to generating schedules is not sufficient anymore. Flexibility and agility characterize new production systems. Therefore, answering to the dynamic changes in the environment while maintaining good performance requires new management approaches. Now, Industry 4.0 and the technologies that characterize it are mainly focused on the economic aspects of conducting business. Therefore, advanced technologies of Industry 4.0 must be applied also from a social aspect where a more advanced society arises - Society 5.0.

It is important to assess the distinctions between Industry 4.0, Industry 5.0, and Society 5.0. With Industry 4.0, Industry 5.0, and Society 5.0 each occupying separate yet connected concepts, the landscape of technological and societal advancement is complexly layered (Zizic et al., 2022). To fully comprehend the wider spectrum of development, these differences must be clarified. From the Fourth Industrial Revolution came Industry 4.0. The automation and digitization of manufacturing processes are what it focuses on most. The main goal of Industry 4.0, which is based on the integration of cyber-physical systems, the Internet of Things, and cloud computing, is to improve and optimize industrial processes. This period encompasses the rise of automation, which paved the way for more efficient industrial operations through the synchronization of machines and data. Moving forward, the European Union's view of Industry 5.0 encompasses more than just automation. Despite expanding on Industry 4.0's foundation, it gives a lot of attention to the mutually beneficial relationship between people and machines. Co-creation, adaptability, and a renewed focus on human-centred collaboration in manufacturing are the cornerstones of Industry 5.0 (Ghobakhloo et al., 2022; Xu et al., 2021). This evolution emphasizes how crucial it is to combine technological development with human insights and sustainable development of human-centric society (Alexa et al., 2022; Carayannis & Morawska-Jancelewicz, 2022).

On the other hand, Society 5.0 presents a broader perspective that goes beyond the limitations of industrialization. It offers a thorough development framework rather than being purely based in manufacturing or production. Fundamentally, Society 5.0 integrates socio-cultural evolution with technological developments, such as those in smart production. Here, leveraging technology to address current societal challenges, particularly those that are common in developed societies, is the aspiration rather than merely economic growth.

It is important to take note of how these concepts interact. While Industry 4.0 lays the foundation for the technological advancements essential to Society 5.0, it is Industry 5.0's human-centric views that most strongly align with Society 5.0’s broader social aspirations (Gladden, 2019). The industrial and societal aspects are bridged by the combination of technological advancement from Industry 4.0 and the ethics of human-machine collaboration from Industry 5.0.

Industry 5.0 elevates the narrative with human-machine collaboration and ethical production considerations, while Industry 4.0 is the key to automation and real-time data sharing (Tlili et al., 2023). While addressing issues such as environmental concerns, aging populations, and urbanization, Society 5.0 is a forward-thinking idea that aims to balance societal well-being with technological advances.

Currently, there is a lack of systematic reviews of literature in the domain of Society 5.0 when it comes to the transition process towards Society 5.0 and what role managers of enterprises in a transitional setting have. This current paper aims to fill this gap in literature by conducting a systemic review of 54 papers in various domains of society and business (education, technology, manufacturing, ICTs, innovation, e-commerce, sustainability etc.).

The main goal is to obtain a clear and significant insight into the processes that characterize the transition to Society 5.0. Additionally, the potential role of mangers is discussed. The result of this paper is a theoretical model that presents the identified processes and manager roles in the transition to Society 5.0. The review is guided by three main research questions. These are:

1. What processes characterize the transition to Society 5.0?
2. How can managing the processes affect the transition?
3. What role do managers have in the complex ecosystems from which Society 5.0 derives?

The paper consists of three main sections (excluding the Introduction and Conclusion sections). The first section describes the review framework and flow diagram, as well as the applied methodology in the review process. Next, the second section presents the findings of the reviewed studies. The theoretical model includes the labels to see which reference refers to what part of the model. Finally, the findings and the developed model are discussed.

2. Methodology

2.1 Flow diagram of the PRISMA protocol

The systematic review was conducted in accordance with the well-established and credible PRISMA protocol (Moher et al., 2010). This protocol includes four main phases with several steps. The flow diagram is presented on Figure 1.

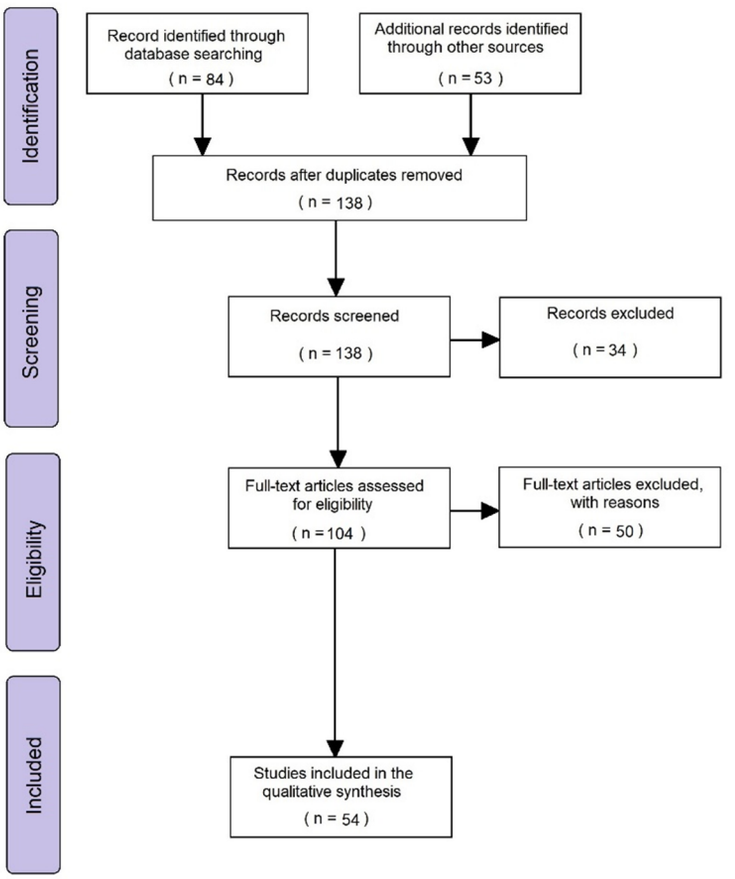

Figure 1: Flow diagram of the PRISMA protocol

The first section of the flow diagram is identification. This includes a robust approach to acquiring as many relevant studies as possible from credible sources (journals, conference proceedings, books, and online databases). The next section includes the screening process where article duplicates are detected and excluded from further evaluation. The screening process was conducted manually by the authors as each acquired eligible article was checked and labelled in accordance with existing citation styles. Afterwards, the third section included another screening where articles were excluded with reasons such as obvious lack of sound methodology, inappropriate subject, questionable publisher, incomplete article, or foreign language, which is not easily translatable with available translating software. The fourth and final section notes the number of studies that were included in the qualitative analysis and synthesis.

2.2 Data collection, eligibility criteria, and risk of bias

The data/study collection process included a thorough and extensive research of various sources - academic databases. The research/review process resulted in qualitative results, which were further used for developing a theoretical model of processes on the realization of Society 5.0. The following keywords were used for article search: Society 5.0 concept; business and globalization; Industry 4.0; Society 5.0 realization; Society 5.0 and manufacturing; Society 5.0; Society 5.0 and enterprise challenges; Society 5.0 and modern management; Society 5.0 and Industry 4.0; Society 5.0 and business; Industry 4.0 and Industry 5.0; Society 5.0 and education; Society 5.0 technological development; Industry 4.0 challenges; Industry 4.0 technologies.

When it comes to eligibility criteria, articles published in journals, conference proceedings, and scientific monographs were considered. Language of writing was primarily English, but other languages were also eligible if appropriately translatable. Recently published articles were a priority, however studies conducted in the near past were also taken into consideration if the articles/studies were still relevant.

No major and significant bias was noted during the qualitative analysis of the obtained studies/articles. However, if the study was not directly or indirectly connected with the processes across industries, Society 5.0 concept, and Industry 4.0, then it was excluded. The sample size, location, data types, and methodological approach of individual studies did not affect the eligibility of these studies and no bias is present. Minor bias can be noted when it comes to the language in which the article is written. English dominates in this domain, but considering the subject and goal of this review, this minor bias does not have a major impact on the credibility of the obtained qualitative results.

3. Results

3.1 Individual findings

In Table 1. the findings of individual studies are presented. In addition, the domain of each study is noted and a label has been assigned. The labelling will be used in the next sub-section where the developed model is presented.

Table 1: Qualitative findings

Reference	Domain	Label	Finding
(Nasution et al., 2021)	E-commerce, Industry 4.0 and Society 5.0	PROC001	The study investigated the changes and influencing factors of Industry 4.0 and Society 5.0 on e-commerce development. The findings indicate that in Society 5.0 there is a present demand for seamless transactions, reliability, more convenience, and effective price comparison between products and services.
(Fathi et al., 2019)	Data analytics and e-commerce	PROC002	In this study, online controlled experiments at a large scale in Society 5.0 are discussed. Manual testing of markets for digitalized businesses is not practical nor effective. Online, precise, and controlled experiments regarding user experience and product performance are the new norm in Society 5.0.
(Darmaji et al., 2019)	Education quality	PROC003	The paper addresses the concept of quality in education in the context of Industry 4.0 and Society 5.0. The findings indicate that school principals can influence teachers and educators to be open to improving their knowledge and skills when it comes to technological innovations.
(Bogojevic Arsic, 2021)	Artificial intelligence	PROC004	The paper investigated the application of artificial intelligence techniques in financial risk management. It was noted that artificial intelligence techniques significantly improved market risk and credit risk management.
(Suwatno, 2019)	Education and competitive knowledge	PROC005	Education must keep pace with Society 5.0. It is imperative that postgraduates acquire competitive knowledge (soft skills) so that they should more easily face the domestic and foreign labour markets.

Reference	Domain	Label	Finding
(Soltysik-Piorunkiewicz & Zdonek, 2021)	Industry 4.0 and open data	PROC006	The paper addresses the importance of open data in Industry 4.0, and how it affects sustainable Society 5.0. Digitation and data-based systems in Industry 4.0 can contribute to social and economic sustainability. As the businesses are increasingly digitized and e-commerce evolves, managing the open-data sector is becoming an important aspect of Society 5.0.
(Aprilisa, 2020)	Education and curriculums	PROC007	The study points out the necessity of evaluating and updating curriculums to adapt to the digital transformation and Society 5.0. The study notes that soft skills and knowledge are most valued in the new industrial revolution.
(Markovic et al., 2022)	Branding and customers	PROC008	The paper analysed customer satisfaction and brand loyalty. IT was noted that brand personality as a concept has as important role in customer satisfaction development and customer loyalty.
(Damayanti & Jumiyati, 2020)	Education and management	PROC009	The importance and role of the principal is analysed regarding improvement of quality of education in schools. The principal must make efforts to achieve and maintain competitiveness of the school and meet the requirements of Society 5.0 as a whole.
(Poor et al., 2020)	Education and business	PROC010	The paper discusses e-learning as an important factor in organizational performance in the modern business environment. The paper notes that e-learning presents a powerful tool for increasing intellectual capital in enterprises. It can be argued that e-learning as a concept can significantly contribute in the transition towards Society 5.0.
(Miwa, 2020)	Education and skills	PROC011	Expectations from early childhood education, in the context of Society 5.0, were analysed. It was found that important skills for children and the youth when it comes to prospering in Society 5.0 are: digital literacy - based on basic academic and social skills, scientific and mathematical knowledge, critical thinking, autonomous learning, curiosity, sensitivity, perseverance, and entrepreneurial spirit.
(Popovic & Rajovic, 2021)	Smart cities	PROC012	In this paper the impact of Industry 4.0 on smart city development is discussed. The technologies that characterize Industry 4.0 shape the living of every individual both in urban and in rural areas. Within the context of smart cities, Industry 4.0 technologies enable efficient environmental protection through the application of the circular economy concept.

Reference	Domain	Label	Finding
(Simic et al., 2020)	Human resource management	PROC013	The study analysed human capital and SME performance. It was noted that human capital indirectly affects organizational performance through entrepreneurial leadership.
(Bakator et al., 2021)	Data, Business, and the Digital Economy	PROC014	The paper analyses customer data and conducting business in the digital economy. It was noted that CRM has a significant influence on how business is conducted in the digital economy. Data analytics must consider data security and enterprises should focus on data-driven strategies. C2B relationships must abide to ethical and moral mechanisms, which have to be implemented in order to move towards Society 5.0.
(Costa & Castro, 2021)	SMEs and E-commerce	PROC015	This study analyses the emergence of e-commerce in SMEs and discusses strategic options for digital transition. The study notes two main groups of determinants that affect e-commerce adoption on SMEs. The first are external determinants (social industry pressure, business environment, public policies, existing infrastructure, and security and trust issues). The second group are organizational determinants (technological readiness, organizational readiness, technology awareness, perceived benefits, digital literacy, resources, employee knowledge and skills, and resistance to digital change).
(Tornjanski & Cudanov, 2021)	Sustainability and Society 5.0	PROC016	The paper analyses organizational empowerment and sustainability in the context of Society 5.0. It was found that a successful digital transformation on the road to Society 5.0 requires digital leadership, cultural renewal, structural reorganization, technology revamp, process redesign, and incentive realignment.
(Skobelev & Borovik, 2017)	Technologies of Industry 4.0	PROC017	The technologies that marked Industry 4.0 are no longer only in the service of progress, but also in the service of well-being of the humanity. This paper presents modern technologies, such as Internet of Things (IoT), cyber-physical systems, artificial intelligence, etc., which will ensure the transformation into Society 5.0.
(Wen & Chen, 2021)	E-business	PROC018	The article discusses e-business value creation in SMEs. The findings indicate that technology readiness and competition on the market have an impact on the intensity of value creation.

Reference	Domain	Label	Finding
(Fukuyama, 2018)	Digital transformation	PROC019	Digital transformation is inevitable. It is necessary to recognize the negative effects and address in a timely manner. Society 5.0 provides approaches to reduce negative effects of digital transformation. The participation of as many stakeholders as possible and the dissemination of best practice is recommended.
(Muslikhin et al., 2021)	AI and Society 5.0	PROC020	The article discussed artificial intelligence of thing (AIoT) and its application in online shops (e-commerce) in the context of Society 5.0. AIoT in Society 5.0 can be characterized as efficient, fast, and convenient. The AIoT algorithm can be implemented in online shops in order that they should follow emerging trends in Society 5.0.
(Nagasato et al., 2018)	Technology advancement	PROC021	To achieve Society 5.0, great efforts are needed from organizations and individuals when it comes to information technology use and data collection. One of the big challenges is bridging the 5 walls that present the core of Society 5.0. These are: Ministry and agencies, legal system, technologies, human resources, and social acceptance.
(Ozdemir & Hekim, 2018)	Technology and risks of innovation	PROC022	The mass use of technology in all segments of society and industry increases the risk of abuse among individuals and groups and bring a complete collapse of societal and economical mechanisms and ecosystems. Industry 5.0 offers a solution through three-dimensional symmetry in the design of an innovative ecosystem.
(Martynov et al., 2019)	Technology and digital industry	PROC023	An analysis of modern technologies that are a condition for the organization of the digital industry in enterprises was conducted. It was found that technologies that enable the transition from Industry 4.0 to Industry 5.0 comprise societal and society-centric elements that establish balance between economic and a societal aspects of industrial revolutions.
(Nagahara, 2019)	Technology	PROC024	The project involved people from different fields. The paper analyses the concept of Society 5.0 and the key technologies of that concept. The following main technologies were noted: networked control, distributed and delegated optimization, advanced artificial intelligence, sensor and actuator implementation, global and local control, social network and game theory, security.

Reference	Domain	Label	Finding
(Salimova et al., 2019)	Technology	PROC025	The study notes that the connection between the goals of digitalization and the goals of sustainable development through the concepts of Industry 4.0 and Society 5.0 is an imperative for successful adaptation to the changes that Society 5.0 brings.
(Serpa & Ferreira, 2019)	Sustainability of digital innovations	PROC026	Digital technology is part of Society 5.0. This paper provides a theoretically oriented reflection on the sustainability of digital innovations and describes the inherent heuristic potential of digital technology for the successful development of the Super smart Society. It was noted that the liberation of financial markets and telecommunication markets is an important step towards Society 5.0.
(Aslam et al., 2020)	Technology and innovations	PROC027	This study points to a new framework for innovation management, which makes them understandable and applicable. The framework includes an innovation ecosystem, customer value-based entrepreneurship, user/human centred, design-thinking management.
(Sudibjo et al., 2019)	Education and learning characteristics	PROC028	The paper addresses learning characteristics in the era of Industry 4.0 and Society 5.0. The main findings note that the use of the Internet, social media, and overall use of information-communication technologies form a new paradigm of education. Collaborative human learning is given focus as an effective way of acquiring knowledge and experience. It was also noted that learning facilities of the new digital era must be flexible and innovative.
(Longo et al., 2020)	Technology in Industry 5.0	PROC029	A survey was conducted among industry leaders from different enterprises, and it was determined that value-oriented and ethical technological engineering in Industry 5.0 is an urgent and sensitive topic. A framework of principles has been proposed: Value Sensitive Design (VSD) that illustrates the symbiosis of man and machine in the factory of the future.
(Atina et al., 2021)	Employees	PROC030	The authors examined the readiness of employees in Society 5.0 when it comes to facing technological advances. The results showed that Society 5.0 had a positive impact on employees that manifested itself through greater digital literacy of people, and thus better quality of work. On the other hand, it has been proven that understanding the concept of Society 5.0 does not affect employee satisfaction.

Reference	Domain	Label	Finding
(Karpunina et al., 2021)	Technology and risk assessment	PROC031	The research is aimed at studying the essence of Society 5.0 regarding state policy. It has been determined that the basis of state policy is digital risk management. The risks are systematized into three levels: information and technological risks, socio-economic risks, and societal risks. Risk assessment in the process of social change and economic development play an important role in successfully tackling the challenges of Society 5.0.
(Yang et al., 2021)	Technology	PROC032	The research found that the Green Internet of Things (G-IoT) is a key tool of Society 5.0 in creating a healthy and sustainable environment. Various statistical models are presented, with an emphasis on the Weibull distribution. Its applicability is shown by data lifecycle analysis. The results indicate that the G-IoT positively affects sustainability from a socio-economic aspect.
(Ellitan & Anatan, 2019)	Industry 4.0 and strategy	PROC033	The paper deals with the changes that have befallen enterprises from Industry 4.0 to Society 5.0. Two strategic approaches were considered: leadership and flexibility. In both cases, businesses rely on cloud technology, the Internet of Things, analytical integration, product digitization and human-centric technological solutions.
(Fukuda, 2020)	Technology and Innovation	PROC034	The article discusses science, technology, and innovation activities as ecosystems in the context of Society 5.0. The risks of Society 5.0 are noted, and these are capital risks, labour risks, and spatial risks. The change from the current push-based science, technology, innovation ecosystem (STI ecosystem) to a pull-based STI ecosystem.
(Aquilani et al., 2020)	Industry 4.0 and value creation	PROC035	The study analysed how the characteristics of Industry 4.0 and the technologies that characterize it affect the transition to Society 5.0. In addition, the authors dealt with the role of open investment and joint value creation within this transition. It was found that Industry 4.0 technologies do remain viable solutions, however changes regarding the role of humans and society are necessary.
(Zengin et al., 2021)	Industry 4.0, Society 5.0, and sustainability	PROC036	The paper addresses Industry 4.0 and Society 5.0 in the context of sustainable development goals (SDGs). The study notes a wide array of changes and actions that contribute to sustainable development goals. These are advanced technology adoption in enterprises, value creation in the modern business environment, leadership of science, technology and innovation, smart agriculture, smart cities, and sustainable energy and resource exploitation policies.

Reference	Domain	Label	Finding
(Javaid & Haleem, 2020)	Industry 4.0 and Industry 5.0	PROC037	The paper discusses all industrial revolutions, with an emphasis on Industry 4.0 and Industry 5.0. The key differences between the two industrial revolutions are the concept of human-centric revolution and taking into consideration the social aspects of industrialization besides the economic aspects.
(Polat & Erkollar, 2020)	Industry 4.0 and Society 5.0	PROC038	A comparison of the positive and negative aspects of Society 5.0 and Industry 4.0 was conducted. It was noted that Society 5.0 is human-centred and views technological innovation as a tool for humankind prosperity. On the other hand, Industry 4.0 is mainly centred towards the economic aspects of development (profit). In Society 5.0 sustainability and balance between social and economic aspects of business must be taken into consideration.
(Rahman et al., 2020)	Industry 4.0 and Society 5.0	PROC039	This study discusses the use of advanced technologies in the maintenance of machines and equipment in enterprises. More precisely, machine learning of artificial intelligence is applied in preventive maintenance with the goal to increase reliability and machine vitality. The approach is based on mathematical models and indicate that the future of manufacturing includes such advanced systems for corrective and predictive maintenance. This further translates into higher sustainability and an adequate path towards Society 5.0.
(Potocan et al., 2020)	Industry 4.0 and management	PROC040	This paper analysed and discussed how Society 5.0 balances between Industry 4.0, responsible economic development and solving social problems. Modern management methods and approaches were noted as an important part of the modern business environment.
(Kurniawan et al., 2019)	Changes in the production process	PROC041	The literature reviewed aimed to examine current developments and changes in the production process, to enable small and medium-sized enterprises to more easily switch to Industry 5.0. The conclusion is that the challenges are mainly related to product excellence and that it is imperative to create value both in economic and social aspects.
(Onday, 2019)	Changes in innovation and entrepreneurs hip	PROC042	The study highlights the key domains that should be explored regarding the concept of Society 5.0. The following should be considered: Innovation policy (by the government), entrepreneurial spirit (by society) and entrepreneurial skills (by society and organizations).

Reference	Domain	Label	Finding
(Paschek et al., 2019)	Changes and business	PROC043	Based on interviews with experts and business representatives, an analysis of the impacts and changes that affected the business in Industry 5.0 was performed. Value creation, competitive relations, global economic recession, and other factors were noted as influential factors on the modern business environment in Society 5.0.
(Prasetyo & Arman, 2017)	Smart society	PROC044	The paper discusses the importance of group management systems for developing a Smart-Society platform. Conceptual designing is key in developing support for Society 5.0.
(Deguchi et al., 2020)	Super-smart society	PROC045	In order to form Society 5.0, it is necessary to understand and address four main concepts that are an integral part of such society. These are society focused on man, connecting cyberspace with physical space, society with intensive knowledge, and society driven by data.
(Froehlich, 2017)	Data and security	PROC046	New technologies and the Internet have provided an easy and fast way to access a lot of data, but there has also been an increase in false information, which poses a serious threat. Therefore, professionals must be careful: it is necessary to know the requirements of their profession, to be competent and have knowledge of computer literacy.
(Oliveira & Pereira, 2021)	Data and information	PROC047	The paper analyses the power of information in Society 5.0, and the benefits that individuals have from data management software. New technologies that include data processing and data management on an individual level make an integral part of Society 5.0.
(Ozkeser, 2018)	Lean	PROC048	The study notes that more efficient and effective reconfiguration of infrastructure resources is needed. Therefore, the concept of value management has been introduced in the lean approach in Industry 5.0. Creating and managing value is becoming a key aspect of conducting business.
(Waheed et al., 2022)	Industry 5.0	PROC049	In this paper, it was noted that Industry 5.0 has a role of a moderator in the shared economy in three core streams: environmental performance, social performance, and economic performance. Further, the findings indicate that operational management with the concept of shared economy and with Industry 5.0 can improve the noted three core streams.
(Gurjanov et al., 2020)	Smart city	PROC050	The paper proposes a network scheme of the Smart City, which relies on digitalization of large aspects of human activities. The authors point out the necessity of international cooperation and balance of economic interests, social equality, and environmental security for moving towards Society 5.0.

Reference	Domain	Label	Finding
(Yan et al., 2023)	Industry 4.0	PROC051	Industry 4.0 is characterized by the rise of complex production systems that integrated artificial intelligence, data-driven process monitoring and fault reporting. Real-time fault diagnosis (RTFD) based on cloud computing and big data analysis is a key part of smart manufacturing. Robust datasets and real-time data flow further provide support for decision making.
(Sun et al., 2023)	Green marketing	PROC052	In this study information entropy is applied for industrial process monitoring. The approach is an automatic selection strategy modelling data that are used for the development of an industrial process monitoring framework. This approach is low on labour costs and can be applied with limited labelled normal samples.
(Rashid & Mhaskar, 2023)	Artificial intelligence	PROC053	Artificial intelligence application for clustering and classification, more precisely deep learning and modelling application can positively affect batch processes. Neural network-based models are on the right path towards predicting and controlling process performance, however more development is required to achieve a viable modelling and process control.
(Kirin et al., 2022)	Lean management and education	PROC054	The paper addresses the application of lean management in education. The findings indicate the lean tools that have a positive impact regarding waste reduction.

3.2 Modelling the management model of the transition process to Society 5.0

Based on the qualitative individual findings a theoretical model was developed. The model is presented in Figure 2.

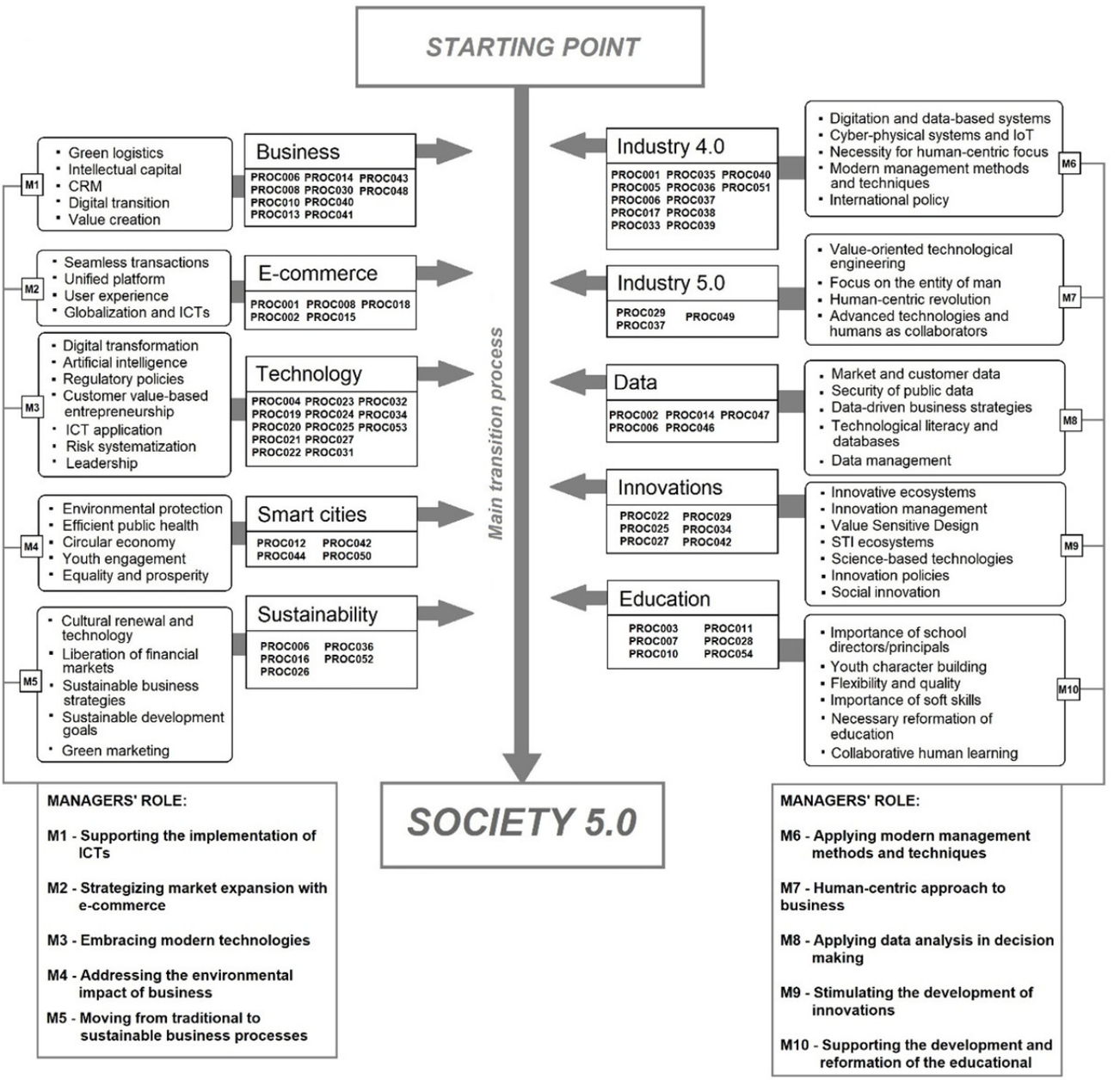

Figure 2: Model of managing process in the transition to Society 5.0

Based on the presented model it is evident that the processes in the transition to Society 5.0 come from a large number of domains and factors that affect the transition. Under each domain, the relevant processes are noted. Adjacent to each domain the key processes that affect and form the main transition process from concept to realization of Society 5.0 are noted.
The managers' role in each domain is also presented.

4. Discussion

4.1 Qualitative assessment and research questions

The review process was conducted in accordance with the PRISMA protocol, and three research questions were noted as a “guide” for the qualitative assessment of literature and model development:

1. What processes characterize the transition to Society 5.0?

Numerous processes encapsulate the transition process to Society 5.0. Within this paper, ten domains were defined (Business, E-commerce, Technology, Smart cities, Sustainability, Industry 4.0, Industry 5.0, Data, Innovations, and Education). Some of the processes within these domains, which can be highlighted are as follows: value creation, digital transition and digital transformation, ICT implementation, improving user experience, artificial intelligence, circular economy, sustainable development, human-centric focus in enterprises, value-oriented technological engineering, data management, innovation and social innovation, and improvement of the education system.

2. How can managing the processes affect the transition?

With effective and efficient management of some of the noted processes, the transition process would be organic with sustainable results. It can be argued that a rushed transition with "quick fix" solutions cannot bring prosperity on an enterprise level, nor on a national level. Managers must address the challenges and combine modern management methods and techniques with decisive leadership to ensure that individual processes are adequately realized. The transition to Society 5.0 requires group effort, both from managers in enterprises, and from the individuals and groups on local or national level. The concept of Society 5.0 is not a finite goal, but rather a checkpoint where a larger number of social, economic, and political mechanisms are aligned with the goals of improvement.

3. What role do managers have in the complex ecosystems from which Society 5.0 derives?

Managers cannot be held accountable, nor do they have a role in every ecosystem that derives from Society 5.0. However, given the way in which the industrial revolution is connected to the concept of Society 5.0, it can be argued that managers have to take on the roles such as **Value creators**, **Initiators**, and **Supporters**. Creating value is an imperative for achieving competitiveness on the globalized market. Creating value refers not only to the products and services, but also to the value given to local communities and society overall. Therefore, Value creators have to think about sustainability, social well-being, and have to be careful about how natural resources, and human resources are exploited. Further, managers as Initiators have to take into consideration the internal and external social and business environments and in accordance initiate activities that will increase the well-being of employees, the well-being of local and wider communities, and at the same time maintain healthy business performance. Finally, managers as Supporters have the task to think strategically about the enterprises and society's future. From here, they must engage in supporting educational facilities, supporting local of wider infrastructure development, organizing fairs, events that stimulate entrepreneurship or innovation among the youth, the employed, and the unemployed. Depending on the characteristics of the enterprise, industry, the characteristics of the local and wider community, managers should take on the appropriate role.

4.2 Implications, limitations, and future research

Based on the conducted review and the obtained qualitative results it can be noted that the implications of this study include multiple sectors and highlight the importance of holistic thinking and intersectoral collaboration in transitioning to Society 5.0.

Business and technology sectors need to ensure that transactions are seamless and convenient. Within the framework of Society 5.0, enterprises should adopt technologies that enable effective price comparisons, improved user experience, and more controlled online experiments. They should also ensure that transactions are reliable and efficient, incorporating AI and data management strategies into their operations.

With the goal to ensure sustainability enterprises should be guided by the principles of circular economy and open data management. Enterprises should leverage AI for effective risk management and drive sustainable societal and economic growth. These sectors must consider environmental protection and efficient use of resources. Knowledge should be used for increasing value output for customers thus creating value for the enterprise as well.

The education sector needs a systematic change to meet the demands of Society 5.0. Curricula should be updated to develop skills in digital literacy, critical thinking, autonomous learning, and entrepreneurial spirit. Educational leaders play a critical role in this transition by motivating educators to embrace technological innovation and align teaching strategies with the needs of Society 5.0. When it comes to limitations, this

study covers ten domains, and these may not capture all aspects relevant to the transition to Society 5.0. The methodology is based on a literature review, and this can in some degree include selection bias where other potentially relevant studies are not included. Furthermore, the findings may not be universally applicable, as the transition to Society 5.0 might vary across different regions and countries due to cultural, economic, and political differences. For future research it is recommended to conduct meta-analyses for obtaining additional insights. Research involving surveys, interviews, or case studies would provide more context-specific and experiential data on the transition to Society 5.0. Research can explore specific impacts of the transition in different industries or sectors, including studying effects on employment, environment, social equality, and public health. Longitudinal studies could track the evolution of Society 5.0, its long-term impacts, and potential future directions.

Conclusion

The conducted thorough systematic review aimed at the processes in transitioning to Society 5.0, has provided a significant insight into this complex subject. The goal was to present the transition processes and the roles of managers in this transition. The developed model manages to present an overview of integral processes and managers' roles in the Society 5.0 concept. Technology has proven to be an essential component, capable of transforming the whole world. With people who have acquired knowledge in various fields and strengthened their character, who respect the principle of family, their neighbours, and people around them, with the help of technology it is possible to contribute to the spread of prosperity in society on a local and global levels. The main limitations of the paper are the lack of non-English studies and the potential bias towards English sources. However, given the goal of the paper this limitation is acceptable. For future studies, it is recommended that individual domains and specific enterprises (by interviewing managers) be addressed and that details concerning certain processes that play a part in the realization of Society 5.0 should be closely considered. Some of these domains could be, but should not be limited to education, technology and innovation for value creation, government policies, challenges and risks on the path towards Society 5.0.

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Received: 2023-06-01
Revision requested: 2023-10-05
Revised: 2023-10-11 (1 revision)
Accepted: 2023-11-02

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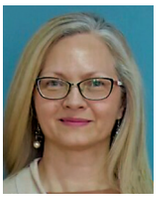

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