

The impact of the digital ecosystem on the aspect of entrepreneurial business and human resource management

Marijana Maksimović^{1*,†} and Vesna Zabijakin Chatleska^{2,†}

¹ Institute of Social Sciences, Kraljice Natalije 45 11000 Belgrade, Serbia

² Institute for Sociological, Political and Juridical Research, Ss. Cyril and Methodius University in Skopje, Blvd. Partizanski Odredi bb, 1000 Skopje, Republic of North Macedonia

Abstract

The rapid development of digitization and the widespread use of information and communication technologies have led to changes in the business aspect of work. The purpose of this article is to point out the importance and necessity of the application of digital ecosystems in order to create a sustainable competitive strategy. Digitization is also important for the development and improvement of entrepreneurship. Definitions of the ecosystem and elements of the entrepreneurial ecosystem are given. There is also an emphasis on the great role of human resources in the digital ecosystem, mostly from the aspect of employees, and then also from the aspect of consumers. The work is divided into two parts. The first part consists of an introduction, a literature review and the impact of digitization on the entrepreneurial ecosystem. The second part of the work is the impact of digitization and artificial intelligence (AI) on human resource management. In the conclusion, recommendations are highlighted, as well as suggestions for further research.

Keywords

Digitalization, economic system, entrepreneurship, people, changes

1. Introduction

Since the end of the 20th century, the term ecosystem has been widely used, and primarily indicated the need for adaptation in order to reduce the instabilities of digital capitalism [1]. However, the rapid development of digital technologies has been present in the last two decades. A group of scientists Francesco Nacira, Paolo Dini and Andre Nikolai created the concept of a digital business ecosystem in 2002. A digital ecosystem is an “adaptive, open socio-technical system with the properties of self-organization and sustainability”. It was originally inspired by natural ecosystems [17]. The definition of an ecosystem originally arose within ecology, and through economic business it later came in the sense of companies that cooperate to find adequate solutions and meet the needs of customers. This is no coincidence, because both natural ecosystems and business ecosystems, nowadays, strive for sustainability. It is actually a new perspective on creating shared values, in order to achieve better results through innovation and greater competitiveness [10].

The question is justified, what is a digital ecosystem? The very term digital ecosystem actually includes a combination of technologies, in order to reach quality and useful information. Information is drawn from a centralized database where the necessary data is stored [32]. The digital ecosystem is defined as an open access network environment for business; efforts are made to make the interaction efficient and effective; and mainly includes small and medium enterprises. The digital ecosystem connects digital management, digital customer management, digital products, digital sales channel management, digital workplace, digital engineering; digital business models. It includes internal and external networked participants through digital platforms with the help of digital technology [25]. The definition of a digital ecosystem indicates that it is a set of digital services of several companies, which have added value for consumers, and are interconnected through a technological platform. For example, companies like Alibaba Group, Google, Yandex Amazon, Sber, have elaborate development patterns that create new services or startups. They are focused on one area, but in parallel they spread their influence in other areas,

The 11th International Workshop on Socio-Technical Perspectives in IS (STPIS'25) September 17-18 2025 Skopje, North Macedonia.

¹ *Corresponding author.

[†] These authors contributed equally.

✉ mmaksimovic@idn.org.rs (M. Maksimović); vesna.catleska@isppi.ukim.edu.mk (V. Z. Chatleska).

0000-0002-6420-8869 (M. Maksimović); (V. Z. Chatleska).

© 2025 Copyright for this paper by its authors. Use permitted under Creative Commons License

Attribution 4.0 International (CC BY 4.0).

and those areas are primarily from the IT sector, education and artificial intelligence [17]. Based on everything that has been said and read a large number of definitions, the authors offer their own definition of the digital ecosystem, which reads: The digital ecosystem represents an organized network connection, includes companies from various industries and services, with the help of digital technologies in order to harmonize business processes with business requirements, where work takes place in a virtual way with the analysis and storage of a large amount of data.

Furthermore, the question is justified, what constitutes a digital ecosystem? It is a network of people, businesses and platform systems that use technology to interact with each other. Unlike traditional business systems, digital ecosystems use applications, data (information layers), and devices (as physical layers). They interact to help companies develop new products or services. Then the question is who are the users of digital ecosystems, or the direct actors in them. These are companies, individuals and government agencies. With this approach, companies can react to changes in a timely manner, and thus become resilient. Also, companies create innovations faster in order to achieve commercial growth and gain useful experiences with users. The recommended order is to identify customer needs, and only then build a platform to identify problems or trends in order to increase efficiency. In this way, companies can achieve development. Individuals also benefit from the ecosystem because they have quick access to the information they need in order to get better quality services (healthcare), suppliers (cheaper) or better quality products. For example, the companies Apple and Google have their own ecosystems, which enable users to easily find services using devices that are functional. And the platform is the place where various software and other systems are connected, in order to create an original ecosystem. Large enterprises most often use an ERP - enterprise resource planning platform, which helps them manage their business more successfully, from inventory to customers, from websites to sales. By analyzing the obtained data, companies discover what needs to be improved, what is not good and what is, how everything functions, and the possibilities are great. In addition to companies, government agencies use digital ecosystems for responsible and transparent behavior. Since digitalization is all around us, it is part of our physical world, the use of electronic devices and robots is increasing, the amount of data is also increasing, and due to quality analysis and results, in the future ecosystems will only develop [32].

It turns out in practice that network connectivity is very important for business. It mainly refers to the economic field (entrepreneurship), public and private sector, and the capacity to renew existing relationships, as well as to create new ones in the environment. It affects the social and natural environment through technical modeling and expertise [16]. However, technology does not lead to competitive advantage, but the way it is used does. For these reasons, digitalization has led to changes in the way of doing business: buying and selling, increasing efficiency due to accelerated data processing, and has accelerated the connection of companies on a global level. Thus, it affected their productivity in a positive way. Digital ecosystems are closely related to the term platform, software, and it is well known that they are related to concrete practice. Digital ecosystems cover disciplines such as technical, legal and business. However, lately they are increasingly covering the social aspects of digital ecosystems. "The complexity and heterogeneity of digital ecosystems with respect to the involved players indicate that they deserve separate treatment from traditional software systems." [15]. Accelerated digitization requires a changed structure of employees, new and innovative ways of strategic management of companies, but also new ways of processing and storing data due to the development of IT methods." [21]. The new ecosystems created in this way are influenced by fast communications, fast data transfer and fast transport. In such an economic ecosystem, digital technologies have proven to be a new wave of innovation. And it must be admitted that they were adopted much faster than previous generations of innovations. Moreover, their application is almost not questioned [5]. In addition to technological and economic impact, they also have a great impact on human resources, consumer behavior, public policies and administration, but also on the entire social interaction of citizens. The main factor that led to the development of digital ecosystems is high competition in the previously known market, which has become oversaturated. The next factor is the dependence of business on a large amount of data, so a new level of processing and economic business was needed. In addition, the digital ecosystem increases the value of the company, reduces the costs it directs to customers, and increases their loyalty. It can be concluded that this attracts a larger number of potential customers [17].

Digital technologies and digital ecosystems have a positive impact in those countries where

there is support from institutions and from a national culture that supports access to information [36].

2. Literature review

The OECD [24] also indicated the arrival of digital technologies, which are rapidly changing business reality, requiring a higher level of education, digital literacy, efficiency and correct interpretation of the obtained data.

Digitization occurs as part of the re-industrialization of societies and national economies. Digital technologies allow access to information and data in virtual space, but in real time. Life and work through applications have become a reality, and digitalization itself can be part of the reindustrialization of the economy [21]. Subramaniam [33] examined the way in which a company's competitive strategy is affected by the digital ecosystem. The digitization of the countries of Central and Eastern Europe (CEI) and its impact on entrepreneurship was studied, with the conclusion that all countries are digitized, but that the performance differs from country to country, depending on the degree of digitization [32]. Recently, complex business environments have been referred to as ecosystems. One of the most comprehensive literatures is the one that provided an overview of the components that led to the development of the ecosystem, which highlights the main elements and main characteristics of the digital entrepreneurial/business ecosystem, and the key factors that influence the innovative and intellectual development of the region and the ecosystem [26]. Fernández-Portillo et al., in their article "How the digital business ecosystem affects stakeholder satisfaction: its impact on business performance" [11], research the satisfaction of all interested business parties in a digital ecosystem, and consider current trends. There is an article that studies both the blockchain platform and its relationship with the digital platforms of an ecosystem [34]. It must be emphasized that blockchain is not a typical ecosystem because it has some limitations compared to a classic digital ecosystem. Then, Ali and Jabeen [3] also dealt with digitization and economy, connecting entrepreneurial ecosystem and digital ecosystem with economic development. This should help entrepreneurs to organize business and make economically justified decisions. If the dynamics of digital entrepreneurship are more intense, the innovativeness of the ecosystem will be greater [7]. Some authors have classified the literature related to the digital entrepreneurial ecosystem [6]. Farih and Wahabi [10] wrote about the emergence of digital business systems in theoretical frameworks. Other authors also wrote about it [13]. Case study research related to the development of the theory of digital ecosystems was also done [12]. One article outlines the success factors of a digital ecosystem and how that system impacts customers [14]. Another paper explores the mechanism of entrepreneurship organization in an ecosystem [25]. The literature also includes the principles by which the digital ecosystem develops and how digital technologies promote entrepreneurship, which was achieved by studying annual reports, conducting in-depth interviews, and statistical analysis of stock prices [17, 28]. Finally, there is an interesting research on the topic of how digital business systems influence the intellectual development of the region [26]. In general, the development of digitization and artificial intelligence has a direct impact on the management of human resources, regardless of whether it is about those human resources who are employed in the organization, or human resources who appear as consumers [18, 23].

The literature on the topic of the digital ecosystem is growing, but not compatible, and more attention needs to be paid to the connection between ecosystems, digitalization and entrepreneurship. A critical review of the presented literature consists in the fact that it is necessary to group the literature depending on which segment of the ecosystem it refers to.

3. Business ecosystem and digitization

What contributed to the creation of entrepreneurial digital ecosystems was the rapid development of digital technologies. They further led to the ability of customers to meet their needs and make purchases online; change in competition; and overcoming geographical boundaries. Its features are: access to resources and information is easier for many, and this contributes to reducing costs and reducing environmental pollution. One digital ecosystem unites consumers and connects producers on a platform. The progress of digital technologies also improves the investment climate, which contributes to the creation of jobs and the development of new sectors of the economy. The strength of digital entrepreneurial ecosystems is that they have become competitors to IT companies operating globally. Countries that stand out in particular when analyzing the digital development of SMEs are Finland, Malta and the Netherlands [26].

The question "How does digitization affect business operations?" is justified. The answer that follows says that in terms of production capacity, there is an increase in competition, and only the most successful survive. But what is important to emphasize is that there is a reduction in costs [25]. In this sense, further answering this question, it must be said that relations between companies have become more fluid and without territorial restrictions, and the number of business participants in the network has also increased. Communication is facilitated with the emergence of a multitude of platforms [32]. In this transformative ecosystem, the digitization activity of one company is not enough, a network is needed in which all interested parties are connected, which make up the entrepreneurial ecosystem. In digital business ecosystems there are two types of companies. One is focal companies that are in charge of creating and maintaining platforms, technologies and interaction. The other is complementary organizations that are in charge of maintaining the rules that the first companies have set, deliver complementary elements to users. The characteristics of digital business ecosystems are dynamism, heterogeneity, self-sufficiency, symbiosis, co-evolution and platform (based on hardware, software and networks). What is important is that one digital ecosystem can use multiple platforms [10]. Therefore, the digital ecosystem is based on one or more platforms. Mastering digital technologies contributes to making company management easier and more advanced. Thus, the transformation is transferred to social relations, first of all to the economy, and then to society, art and politics. It is important to emphasize that there are different levels of digitization, and that not every ecosystem is digitized in the same way [7].

Digital governance involves channeling activities that include: digital platforms, digital products and services, and digital tools and infrastructure. The use of platforms has become imperative in business. Digital art or internet services can also be added [28, 31]. With accelerated digitalization, the capacity to collect and create new information (based on the collected) becomes virtually infinite. Artificial intelligence, robotics, quantum computing, the IoT domain and nanotechnology greatly help them in this [24]. However, digitalization (i.e. the process of adopting digital technologies) reduces the dependence of business and entrepreneurial ventures on a specific location. It makes it easier to seek opportunities outside the region by alleviating spatial constraints in terms of knowledge and market access. With the evolution of information technologies and business networks, a digital ecosystem has emerged. Its goal is to improve communication and efficiently achieve business results between all stakeholders. Digital technologies within entrepreneurship consist of the following three interconnected elements: digital artifacts, digital platforms, and digital infrastructure [36].

The digital ecosystem in the virtualization phase is document digitization, virtual process and system, adoption of regulations on cyber security. As well as increasing sectoral cooperation through networks and information processing. It saves resources by digitizing information and virtualizing management processes, as well as by establishing relationships with customers. Thanks to digital technologies, the connection of companies is facilitated, and traditional interdependence is transparent with new opportunities for growth. The development from a social network to a digital ecosystem, which gives a new digital identity and data collection (for example, once Facebook, now X) is interesting [25]. So far, people's perception of a company has changed for the better through marketing influence. Today, it can also be changed through digital technology. She does this by spreading stories through social networks and platforms about success, good business practices, positive experiences, entrepreneurship and activities that make

customers loyal. This strengthens the relationship of interaction between producers and consumers [36]. The operation of digital ecosystems is based on software technology, which constitutes the technical infrastructure that locates, combines and transports data. For this, it uses the Internet channel, which is actually the heart of the network exchange. It's all hardware, software and processes. There is no hierarchical organization in this constellation. A business ecosystem goes through four stages: birth, expansion, leadership and self-renewal (it is born in a new form or disappears from the market). Each of these phases faces two challenges: cooperation and competition. Protecting data from competitors is a priority, although negotiations with clients and suppliers remain important. After that comes leadership, which is characterized by high profitability, stability and cohesion [10]. In another approach, like everything in the business world, the digital business ecosystem has its own stages of development that are specific and based on the life cycle of the ecosystem. These are creation, growth and maturity. Other authors presented the following stages: creation (selection of assets, processes, markets, competitors), monitoring (measurable standards, goals) and evaluation (resilience assessment). On this occasion, available resources are used, although the management of digital business ecosystems is complex. Therefore, business ecosystems are a set of connected organizations, even complementary offers. For these reasons, four levels of roles are mentioned, namely: key player (intermediary organizations); niche player (most numerous in charge of building skills and creating added value), dominant and nodal (central) landlord. The last two participants in the network control a significant part of the ecosystem and draw funds from it. Ecosystems manage themselves as autonomous structures, and this characteristic is thought to enable them to thrive. And that it will develop over time, and this happens through cooperation [10].

The main elements of a digital entrepreneurial/business ecosystem are digital platforms, technologies, data, stakeholders, consumers and innovation. And the main features are flexibility (customization), market expansion (wide availability), innovation (new products and services), and efficiency (business optimization). The main elements of the entrepreneurial ecosystem are digital citizenship - users who carry out their business activities as consumers and producers, in an ethical and responsible way, with the protection of personal data and information. The second element is digital entrepreneurs from various industries, who improve their profits and efficiency by participating in the digital ecosystem. In that process, network effects are distinguished, which can be direct and indirect [11]. The patterns and principles of digital entrepreneurship contribute to the competitive advantage of an innovative company. The structure of the digital ecosystem consists of integration services, a common center from which coordination is carried out, and a unique digital platform. There are four levels of structure namely: the semantic core, the functioning of digital services, the user digital service (including the application store - market) and personalized devices and IoT. Digital ecosystems can be developed with the help of own infestations and projects, or joint ventures. Such projects are implemented with already existing enterprises [17]. What is important for a digital ecosystem is a strong base of partners and users. In any case, a quick start is not recommended, because it is by no means a guarantee for success, duration and dominance in business. According to one survey, 83% of digital ecosystems include partners from more than three industries, and 53% have more than five partners. A successful average ecosystem has 27 partners, and the most successful have around 40 partners. For example, Amazon has 67 partners in e-retail, and they include finance, logistics, telecommunications and media. These partners are stationed in different countries and industries, and there are even different contractual relationships (contractual agreement, platform partnerships, investment partnerships). This is crucial for success, and building the right cooperation is crucial for the survival of the ecosystem [14]. The digital ecosystem consists of two parts, one part of the ecosystem is production, and the other part is consumption.

Production systems are interdependent with value chains. Although these are not new phenomena, they have only now been placed in the context of digitization, and have been extended to networks and alliances. Their importance lies in the use of this data when creating organizational strategies. Consumption systems, appeared with the use of the most modern technologies, and they serve to generate data obtained from the use of products or services. What matters to them is the scale of competition, the scale of value creation, and the power of the digital monopoly. Data collected in real time become archived over time. But together they help companies create better insights into customer needs and thus contribute to the creation of

products that are in line with their wishes. Although one should always keep in mind that the needs and desires of customers are constantly changing. Connecting value chains across digital ecosystems requires strategic thinking that is aligned with the times. For example, Alibaba has complete data on the consumer, his needs and plans, the amount of funds. From these opportunities arose the "influence" of Alibaba in the field of consumer loans for small and medium-sized enterprises in China. It is a fight for the market within one ecosystem, both on the production side and on the consumption side. This also means that the barriers to entry into certain market fields are lower, specifically here the loan market for small and medium-sized enterprises. This increases the competitiveness of traditional lenders and the question of whether they can cope with Alibaba's network of opportunities [33].

The importance of the ecosystem in entrepreneurship is recognized through the creation of startups in the economy. Startups use strategic resources such as human capital (knowledge, leadership, culture, tradition, and business practices), financing, market access, physical network infrastructure, as well as formal and informal institutions. Startups are characterized by the flexibility to accept innovations, but on the other hand, they also have the limitation that they cannot realize the required volume of demand. Entrepreneurial ecosystems are unique, and Silicon Valley, for example, is different from all others of its kind. Then, the interdependence of online and market participants within one ecosystem is significant. And most importantly, every entrepreneurial ecosystem is dynamic. The basic characteristic of digital technologies is the digital context, but also the fact that it can be a driver and drive companies to produce and sell more of their products due to expanded market opportunities [4]. Digital ecosystems have been developing for the last twenty years, indicating the large use of digital technologies in the business of companies. This reduces dependence on one location, and provides greater opportunities outside of one region. In this sense, a digital ecosystem has three key dimensions, namely: technological dimension, economic dimension and social dimension. Formal institutions influence through laws, contracts, economic and political rules, and informal institutions influence through customs, norms and business codes. Together, they form the rules of the game in one market, and when they are well coordinated, they lead to a reduction of uncertainty in the market. The quality of digital technologies and a digital ecosystem will depend on the quality of these institutions. It must be emphasized that digital changes can lead to institutional changes and vice versa. However, formal institutions must lead to favorable loans, tax benefits, reduction of bureaucratic rules, transparency and increase in the possibility of subsidies. All this has a positive effect on digital entrepreneurship and the development of the digital ecosystem [36].

Digital technology combines four concepts: digital user, digital technologies, digital infrastructure and digital platform. Actors can organize entrepreneurial processes themselves, and a kind of digital market can be created. Therefore, digitization takes place within an ecosystem, it is not isolated for its own sake, but it contributes to flexibility [6]. Digital technologies in entrepreneurship and business have three forms: digital platforms, digital infrastructure and digital artifacts. Technology-based digital platforms can often remove business barriers, reset economic activity and launch new ventures. Digital infrastructure consists of elements of digital technology that enable communication. It can even increase the competitiveness and productivity of industrial enterprises. An important element of digital entrepreneurship is the digital ecosystem [32].

The entrepreneurial ecosystem takes place in networks, and for them, the most important things are finance, knowledge and talent, in order to realize the interaction. Dynamic interaction leads to new business ventures and business improvements. They also lead to the improvement and modification of products and services. At that level, participants are connected, a knowledge base is created, and a wider context is taken into account besides the digital one, namely the socioeconomic one. Digital entrepreneurship differs from traditional entrepreneurship because marketing, production and jobs are realized through information and communication technologies. Here, the emphasis is on the ecosystem, not on individuals and teams. An important feature is complementarity, because complementary actors, complementary activities and complementary technologies/platforms are connected. However, a justified question arises, is there a control mechanism in an ecosystem? Is it effective enough to protect data misuse? [6, 28]. Thanks to the development of digitalization, social networks have become part of entrepreneurial activities. Different ways of using them, in an individual or professional way, allow free expression of opinions, on the basis of which it is possible to interact and contact

with people who are important for their business [8]. In addition to providing new opportunities for newly formed companies, it has modernized traditional industries, helping them to adapt and survive. So, to become sustainable. In addition, digital technology enables the evolution of companies that are included in an ecosystem [28].

Digital technologies engage customers and contribute to the optimization of resources. They enable companies to respond adequately to market changes that are happening more and more quickly. Thanks to them, the quality of service also improves, which contributes to greater customer loyalty. In an ecosystem there is cooperation but also competition. Participants expect that financing within such a digital network will be less risky, and that it will provide them with strategic expertise [35]. It represents the technical transformation of society, thus creating an innovative ecosystem that enabled survival on the market through entrepreneurial adaptability. In such an environment, entrepreneurs have a business imperative to use digital platforms, tools and business strategies that are based on data and analyzes of virtualized interaction. The use of technology should contribute to easier management and dealing with market challenges. Also, data protection is becoming an important component of business, in the conditions of accelerated digital transformation. Protection against competition, capital investment risks are also monitored through digital infrastructure. This implies training for digital entrepreneurship, in order to successfully implement digital transformation at the enterprise level [22].

Digital entrepreneurship is within the framework of institutions, users and platforms, and a very important characteristic of the digital ecosystem is complementarity. More precisely, it refers to four concepts, namely management: digital users, digital entrepreneurship, digital infrastructure and digital platform. Considering that the digital entrepreneurial ecosystem includes a wide range of functions, it brings together finance, infrastructure, human capital (entrepreneurs, knowledge, leadership, and talent), culture, market and support services. Also, it enables the replenishment of all interested members of the network and their activities, which lead to positive outcomes. The network effect is extremely significant for those products and services whose value depends on the number of users. This is made possible even from a geographical distance, even the cooperation of business partners from different industries, and by supporting cross-sectoral initiatives, thus enabling mutual cooperation for a large number of participants [6]. The efforts of businessmen are to be successful in the conditions of market dynamics, to fulfill the needs of their population, with the aim of increasing the export of products and services (knowledge), and technology [32].

A digital artifact is actually the result of a digital activity, and is actually an application or media content that is completely new. It can also be a digital component, and it offers the end user a new and specific function. The platform is important for digital innovation, because it represents a new way of organizing a company, which is completely different from traditional corporate organizations. Thanks to the platforms, multimillion-dollar companies were created in a very short period of time, which became dominant in digital entrepreneurship [32]. Digitization has contributed to social networks becoming one of the key parts of entrepreneurial activity, and being used for business purposes, not just private ones. They are dynamic and relevant tools, but they are not the primary catalysts of entrepreneurial initiative, but only supplementary [8].

How the digital ecosystem affects business strategies? It is important to say that it has a positive effect in the sense that, thanks to the automation of the process, it contributes to a better and faster interaction with customers. With the help of artificial intelligence, automated and personalized marketing solutions are obtained. Such solutions are of high quality, encourage customer loyalty, and startups can enter existing markets, fight existing competition with reduced costs, and better services [22].

When it comes to international trade, the digital ecosystem contributes to reducing transaction costs when purchasing goods. The leaders in online sales are Asian countries, the USA has the largest number of e-stores in the world, and the European Union has the best infrastructure for online trade [25].

An ecosystem in which digital entrepreneurship plays a significant role leads to the transformation and reshaping of traditional business relationships and structures. It fosters a digital-centric economy. The use of sophisticated digital tools requires a skilled workforce capable of managing platforms, tools, data and strategies. Data analysis should contribute to better

performance in relation to consequence and success. Both physical and digital markets are present, but virtual interaction is pronounced. They are characterized by fluidity and adaptability [22]. In addition to the platform and the network that make up the digital infrastructure, potential consumers, market size, communication in the environment and the base of talented employees -human resources also play a significant role [9].

4. Human resource management and digitalization in the ecosystem

This conceptual work explores the aspects of digitalization and artificial intelligence and their impact on the behavior of human resources, both as employees and as consumers.

At the core of the digital ecosystem concept is the common interest of the community, regardless of whether it is a common geography, a common ethnic or cultural affiliation [12]. However, today in companies employees use artificial intelligence through machine learning, social networks and algorithms. This affects the building of virtual competences. The goal of artificial intelligence is to change human cognitive functions, and the areas in which it has the most influence are health (use for diagnostic purposes, and data protection in health care), then the labor market area, and finally the media area [29].

As for working hours in the digital world, it is uncertain. Network employees often have to respond instantly to customer requests and be engaged on platforms constantly. They are often faced with "burnout", "impossible expectations" as a consequence of unlimited working hours. As a result, stress and anxiety increase. As a result, there is a latent fear of losing one's job. However, many researchers agree that those companies that use e-HRM services benefit from it. Through artificial intelligence, employees can be controlled by the employer. Employers also benefit from machine learning because it helps them make decisions in order to create better performance. Electronic human resource management (eHRM) enables the planning of HRM activities through digital means. Practically, the use of AI in the field of HRM facilitates finding candidates, checking educational levels, selection and similar activities that are necessary for the recruitment of employees. Despite the question of responsibility and validity of decisions made based on AI data is raised, AI helps with the socialization of employees in a company and helps them organize themselves more easily at work [18].

Given that digitization is developing rapidly, that the way of doing business is changing rapidly, timely strategic planning is needed that can protect the participants of a network from market shocks, and therefore competition. The changes that have taken place in the field of human resources management and the labor market with digitization are not new. Nor is the decline in employment in production and industry something that occurred in the second decade of the 21st century. The reason for this is deindustrialization and the dominance of the information and communication sector and the service sector. The new generators of development are the pharmaceutical industry sector, the biotechnology and nanotechnology sector. There is the use of robotic and digitized equipment, which, among other things, leads to changes in the company's strategic operations. This way of doing business requires a highly educated workforce, which is able to adapt to the market and make companies competitive. In the long term, a higher level of education, along with other business factors and the support of public policies, can lead to the sustainability of companies and the economy of a country [21]. Industry has traditionally employed a large number of workers with secondary education, and therefore deindustrialization presents a major challenge to lower living standards or job loss. Only finding a job faster reduces the negative effects of losing a previous job. "Smart factories" employ trained experts who can perform their work remotely. This is a particular danger for developing countries, because they have a large number of structurally maladjusted workers. From these differences, they must increase the participation of the ICT sector in the overall structure, improve the work of institutions, as well as increase the knowledge and education of human capital [27]. Those countries must develop a comparative advantage, make strategic plans, so that the implementation does not threaten the nation's competitiveness. The development of technology in the field of data generation and transmission, data storage and processing, the development of robotics and the use of robots at work represent major challenges today. Thus, technological changes lead to economic, political and social changes, but also to changes in the way of doing business, which must not allow discontinuity in employment and economic development. With

the fourth and fifth industrial revolutions, great changes occur in the relationship between work and free time [21].

Human resources include the talents of workers, leadership, education and training, i.e. knowledge, and digital technologies can affect the reskilling of the workforce. In this sense, it is important that national policies related to education are adapted to digital trends. In this sense, it is said that digital technologies encourage innovation, but also bring risks in terms of employment. Thanks to innovations, the workforce receives increased income. This is accompanied by an increase in better life, health, and overall standard of living [2]. It must be said that artificial intelligence and machine learning have improved the flow and storage of information. As a result, their value also increased. Thanks to that data, analyzing and aggregating it, companies improve relations with customers and product quality [11].

Although it appears that digital tools are completely independent of the activity shell, this is not entirely the case. Information and communication technologies require human participation. In order to automatically perform digital and business activities, human activity is required. For example, in order for artificial intelligence to be able to provide answers to numerous questions, it must be "filled" with data entered by humans. And only then does the processing take place, and that causes changes in the processes. It personally refers to the speed of data processing. In addition to digital knowledge, digital technology, digital platform, digitization process and successful digital transformation of the previously traditional company. Thanks to this, a digital business model and strategy is created. For this, education related to social digital entrepreneurship is necessary. Therefore, it is important how the network works, and each member through the different roles they have (direct or indirect), as well as responsibilities. In this sense, it can be said that digitization changes the interaction in society, and that it creates interconnection between citizens and technology, and organization and technology [32]. As for the labor market, it affects the development of freelance platforms by reducing geographical barriers in job searching. It also increases the flexibility of labor supply and demand, supports all-day learning and investment in skills that can be useful at work [25]. In addition to the sphere of business, digital transformation includes all spheres of human activity, which implies the construction of solid corporate management, with monitoring of changes, and employees will have the opportunity to monitor changes and align their business with it [17].

The digital ecosystem also affects intellectual development, which implies the activation of human resources and their intellectual potential and new technologies that were created on that basis. Thus, there is an improvement in the development of human resources, the improvement of the educational system, the involvement of scientific staff, in the exchange of knowledge that is necessary for encouraging entrepreneurial activity. A well-developed and built entrepreneurial ecosystem contributes to new human resource training and talent attraction. Apart from technical management, one of the most complex is the management of human resources in the digital ecosystem. There are several key factors that influence the development of the region in the intellectual sense, related to human resources, namely economic (level of employment, structure of the economy), social factors (education, professional training, health care or population income growth), ecological (efficient use of land, water and energy), technological factors (access to new technologies, number of patents), infrastructural factors (communication and logistics infrastructure), and political-legal factors (legislative support, development of entrepreneurship, political stability), [26].

The digital ecosystem is based on digital infrastructure (telecommunications and digital literacy), digital society and digital economy, but also four cross-sectoral topics, namely: new technologies, cyber security, inclusion, and geopolitical positioning. The digital society must ensure the respect of digital rights, the protection of basic human rights in network connectivity, the organization of civil society so that digital repression does not occur. It also includes online government, digital provision of services and management of government processes. Finally, the digital economy includes digital financial services, digital commerce, and the development of digital startups. Equally important is the digital talent pool, the training and development of workers, which must be efficiently organized [26]. Human resources are responsible for taking care of those key business areas that bring the most profit [17]. This approach leads to the development of innovations and the development of the entire company, but also to the facilitated exchange and improvement of skills, and everything and the digital ecosystem becomes the property of the community [12].

The digital perspective has affected human resources in the sense that it raised the issue of time spent at work, the issue of free time, the issue of communication methods, security communication and communication regulations. The issue of time spent at work - initiates the question of whether working online actually abolishes the limit of working hours. Free time - the issue of free time is opened, in which the possibility of entertainment is limited by business obligations. Method of communication - whether human resources communicate exclusively electronically, or whether there is still social contact and collegial socializing. How do they communicate with robots? Communication security - are communications safe, can data protection in a company be ensured? Regulation of communication - and finally, whether the legal legislation follows the regulation of communication, what is allowed and what is not when addressing employees and consumers electronically.

Another aspect of human resources is the customers' factor. And the demand for goods by customers is facilitated by the use of digital technologies and ecosystems. There are whole package deals that affect better efficiency and lower costs. Digital communications are also present in retail, as sellers address customers through digital communication, using applications to provide information. In return, they receive personalized information with the help of which they can improve their products [25]. As far as customers are concerned, ecosystems have the role of retaining customers, through their management method. This means that they can sell their products in one digital market, but also direct them to their other product in another market. For this reason, the cross-market impact, the ecosystem is of great importance. For example, owners and leaders in companies engaged in the production of agricultural and food products consider such innovative activities brought about by digitization as a method for increasing profits. The use of intellectual internal resources that generate information flows also contributes to this [5]. In the information age, consumers get information faster and more easily, and information is more accurate and cheaper than ever before [21].

Thus, AI enables personalized shopping, virtual trials and creation of customized designs, with the aim of increasing consumer satisfaction, and thus business efficiency. AI has the ability to create original content that is completely new, influence purchasing decisions and enable brands to offer consumers authentic products tailored to them and thus foster their loyalty. Therefore, it is important to point out that AI has the ability to provide the consumer with highly personalized and targeted marketing content. In order to achieve this, the history of consumer behavior, activity on social networks is reviewed, and personalized advertisements are created based on this. This leads to consumer satisfaction, but also to improved business engagement. Such communication must be continuous, because consumers are constantly receiving new advertisements from other manufacturers. And in this context, data protection is of great importance, in order to prevent abuse and consumer churn. And there is another concern, and that is not to become too dependent on artificial intelligence. And that consumers does not reduce their ability to make independent decisions. And it's important to ask in future research how the growing role of AI affects both consumers and businesses [23].

5. Conclusion

This conceptual work, which deals with the research of the digital ecosystem on business, but also on the behavior of employees and consumers, indicates the necessity of applying digitization in business. In addition to increasing competitiveness, it also increases the level of innovation, and increases the intensity of interaction with consumers. Digitization of human resources brings a lot of opportunities, but it also brings a lot of uncertainty [21]. During the COVID 19 pandemic, there was a sudden use of digitization and platforms, because the population lived "at a distance" and goods were bought through online sales channels [19, 20, 30]. Due to the great importance of the digitalization and entrepreneurial ecosystem, emphasis is placed on their use, but also its abuse.

Observation ranges from better access to strategic resources to misuse and unauthorized use of data [4]. The rapid development of digitization forces companies to integrate information and communication technologies (ICT) into their operations. This manifests itself in a number of ways, namely through: the Internet of Things (IoT), connecting smartphones to computers, 3D printing and the use of sensor technology. Companies are increasingly creating value online, and that value depends on various stakeholders, to the benefit of all. In this digital context, "value is

created together”. In order to maintain the sustainability of the industry, companies must have proper coordination with their competitors and those who are not. Therefore, the digital ecosystem has sent a digital business ecosystem, and these forms of cooperation are increasingly popular. Their main goal is to come up with a new innovative product or solution. The big question is how this way of doing business came about and what prompted companies to cooperate in this way? It can be said that the development of digital entrepreneurial ecosystems has a positive effect on the innovative and intellectual development of the region as a whole, thanks to the joint efforts of various economic entities, public policies and agents [26, 10]. The development of digital ecosystems also allows companies themselves to maintain employment at an enviable level. This is achieved through retraining and training of staff [17].

Further research should be focused on research on national entrepreneurial ecosystems that have not been sufficiently explored. No related threads. In particular, the generated added value of all participants of a digital ecosystem should be investigated. It is also necessary to research and analyze the best practices around the world, for the development of new digital business systems. Also investigate how different levels of the enterprise system and virtual boundaries affect human resources and consumers. In accordance with the theory of organizational changes, it is possible to explain the motivation for the transition of business ecosystems. Traditional forms are now in the second plan, and digital forms of work are in the first. In this transformative context, consumers and businesses are more tightly connected by digital technology and AI. And consequently, there was a wider collection of data, their analysis and storage in the history of the behavior of employees and consumers. Research should also be continued within the interaction of digitization and manufacturing and service companies, in one ecosystem.

Digital communication and AI are changing social interaction, making it faster, more efficient and tighter.

Acknowledgments

The paper was written as part of the Research Program of the Institute of Social Sciences for 2025, which is supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia.

Declaration on Generative AI

The authors have not employed any Generative AI tools.

References

- [1] Z. J. Acs, D. Sameeksha, J. Hessels. Entrepreneurship, economic development and institutions. *Small Business Economics*, 31 (2008) 219–34.
- [2] D. Ahlstrom, A. Y. Chang, J. S. T. Cheung. Encouraging Entrepreneurship and Economic Growth. *Journal of Risk Financial Management* 12(178) (2019) 1-14. DOI: 10.3390/jrfm12040178.
- [3] J. Ali, Z. Jabeen. Digital ecosystem, entrepreneurial ecosystem and economic development as enablers of digital technology entrepreneurship. *Managerial and Decision Economics* 45(6) (2024) 3929-3941. <https://doi.org/10.1002/mde.4233>.
- [4] S. H. An. The Ecosystem Approach to Entrepreneurship Policy in the Digital Era. *KIET Industrial Economic Review* 29(1) (2024) 20-28. <http://dx.doi.org/10.2139/ssrn.4767473>.
- [5] S. Y. Barykin, Kapustina, I. K. Vasilievna, T. Viktorovna; Y. V. Konstantinovich. K. Y. Aleksandrovich. Economics of digital ecosystems. *Journal of Open Innovation: Technology, Market, and Complexity*, 6(4) (2020) 1-16. <https://doi.org/10.3390/joitmc6040124>.
- [6] M. Bejjani, L. Göcke, M. Menter. Digital entrepreneurial ecosystems: A systematic literature review. *Technological Forecasting and Social Change* 189(April) (2023) 122372. <https://doi.org/10.1016/j.techfore.2023.122372>.
- [7] T. Beliaeva, M. Ferasso, S. Kraus, E. J. Damke. Dynamics of digital entrepreneurship and the innovation ecosystem. *International Journal of Entrepreneurial Behaviour and Research* 26(2)

- (2019) 266-284. DOI: 10.1108/IJEER-06-2019-0397.
- [8] C. Blanco-González-Tejero, K. Ulrich, S. Ribeiro-Navarrete. Can Social Media Be a Key Driver to Becoming an Entrepreneur? *Journal of the Knowledge Economy*, 15. 4. 47. (2024) 16780-16798. DOI: 10.1007/s13132-024-01764-9.
 - [9] Y.Chen, Z.Wang, J. Ortiz. A Sustainable Digital Ecosystem: Digital Servitization Transformation and Digital Infrastructure Support. *Sustainability* 15 (2023) 1530. <https://doi.org/10.3390/su15021530>.
 - [10] H. Farih, R. Wahabi. Emergence of Digital Business Ecosystems: A theoretical framework. *International Journal of Accounting, Finance, Auditing, Management and Economics* 3(6-1) (2022) 212-225. <https://doi.org/10.5281/zenodo.7398417>.
 - [11] A. Fernández-Portillo, N. Ramos-Vecino, A. Ramos-Mariño, et al. How the digital business ecosystem affects stakeholder satisfaction: its impact on business performance. *Review of Managerial Science* 18.9. (2024) 2643–2662. <https://doi.org/10.1007/s11846-023-00720-2>.
 - [12] GPAI. Digital Ecosystems that Empower Communities: Exploring case studies to develop digital ecosystems theory and templates for technology stacks. Report November (2024) Global Partnership on Artificial Intelligence (GPAI).
 - [13] P. Heidhues, M. Köster, B. Kőszegi. A theory of digital ecosystems. ECONtribute Discussion Paper 329 (2024) University of Bonn and University of Cologne, Reinhard Selten Institute (RSI), Bonn and Cologne.
 - [14] M. G. Jacobides, N. Lang, N. Louw, K. von Szczepanski. What Does A Successful Digital Ecosystem Look Like? (2019) Boston: Boston Consulting Group.
 - [15] M. Koch, D. Krohmer, M. Naab, D. Rost, M. Trapp. A matter of definition: Criteria for digital ecosystems. *Digital Business* 2. 100027. (2022) 1-13. <https://doi.org/10.1016/j.digbus.2022.100027>
 - [16] M. Krivý. Digital ecosystem: The journey of a metaphor. *Digital Geography* 5(100057) (2023) 1-9. <https://doi.org/10.1016/j.diggeo.2023.100057>.
 - [17] M. Lipovenko, A. Gostilovich, S. Gostilovich, K. Ivanov, L. Ming. Patterns and principles of the development of digital ecosystems. *Revista Scientifica* 35(01) (2022) 174-185. <https://doi.org/10.5377/nexo.v35i01.13929>.
 - [18] M.Maksimović, J.Zvezdanović Lobanova, & I.Nikolić. International Human Resource Management in the New Geoeconomic Order and Artificial Intelligence. In: Maksimovic, M., & Rohrbach, W. (Eds). *The Geo-Economic Landscape: A Market and Social Approach*, pp. 26–53. (2024). Edited Volumes. Belgrade: Institute of Social Sciences; Krems: University for Continuing Education Krems, Danube University Krems. <https://doi.org/10.59954/QGRL7430-1>.
 - [19] M. Maksimović. Covid capitalism and the labor market. *Srpska politička misao*, 76(2). (2022).55–74. DOI: <https://doi.org/10.22182/spm.7622022.3>.
 - [20] M. Maksimović & N. Cvetičanin. Geoeconomija i preduzetništvo u vreme pandemije Covid-19. *Sociološki pregled*, 55(3), (2021) 930–952. DOI: 10.5937/socpreg55-33257.
 - [21] M. Maksimović. Globalizacija i promene u domenu rada: život i rad preko aplikacija. In: Snežana Grk & Dejan Molnar (ur). *Svet i Srbija - vreme promena*, pp. 199-220. (2017). Beograd: Ekonomski fakultet, Centar za izdavačku delatnost.
 - [22] D. M. Mitache, L. F. Spulbar, A. Smarandescu. Exploring the Ecosystem of Digital Entrepreneurship. *Annals - Economy Series* 6.1. (2024) 63-70.
 - [23] D. Mladenović. The Multifaceted Implications of Generative Artificial Intelligence on Consumer Behaviour: A Conceptual Analysis. In: Maksimovic, M., & Rohrbach, W. (Eds). *The Geo-Economic Landscape: A Market and Social Approach*, pp. 98–123. (2024). Edited Volumes. Belgrade: Institute of Social Sciences; Krems: University for Continuing Education Krems, Danube University Krems. <https://doi.org/10.59954/QGRL7430-4>.
 - [24] Organisation for Economic Cooperation and Development (OECD). *Enabling the Next Production Revolution: the Future of Manufacturing and Services - Interim Report*, <http://www.oecd.org/mcm/documents/Enabling-the-next-production-revolution-the-future-of-manufacturing-and-services-interim-report.pdf>, (2016).
 - [25] O. Osiyevskyy, Y. Umantsiv, Y. Biliavska. Digital Ecosystem: A Mechanism of Economic Organization of Enterprises of the Future. *Rutgers Business Review* 8.2. (2023) 175-194.

- [26] O. Popelo, V. Marhasova, O. Perepeliukova, O. Kakhovska, M. Oprysok, & S. Khomenko. The Role of the Digital Business Ecosystem in Innovative and Intellectual Development of Regions. *Journal of Theoretical and Applied Information Technology*, 103(1) (2025) 40-51.
- [27] D. Rodrik. Premature deindustrialization. *Journal of Economic Growth*, 21(1), (2016) 1–33.
- [28] A. Z. Shaker, L.Wan, S. Steven. How digital technology promotes entrepreneurship in ecosystems. *Technovation* 119 (2023) 102457. DOI: 10.1016/j.technovation.2022.102457
- [29] R. Sovilj, S. Zlatanović. Artificial Intelligence in Health Care - Applications, Possible Legal Implications and Challenges of Regulation. In M. Reljanović: *Regional Law Review* (2023) 223-235. DOI: 10.56461/iup_rlr.2023.4.ch14
- [30] R. Sovilj & S. Stojković-Zlatanović. Tackling the Impact of the COVID-19 Pandemic in Economy and Labour – a Case Study of Serbia Regulation. *Medicine, Law & Society*, 14 (2) (2021) 301-320.
- [31] A. H. So Hyun. The Ecosystem Approach to Entrepreneurship Policy in the Digital Era. *KIET Industrial Economic Review* 29(1) (2024) 20-28.
- [32] L. Szerb, E. Czigler, G. Z. Horváth. The Digital Entrepreneurship Ecosystem in the Central Eastern European Countries. *Foresight and STI Governance* 18(4) (2024) 18–32. DOI: 10.17323/2500-2597.2024.4.18.32.
- [33] M. Subramaniam. Digital ecosystems and their implications for competitive strategy. *Journal of Organization Design* 9.12. (2020) 1-10. DOI 10.1186/s41469-020-00073-0
- [34] A, Šilenskytė, J. Butkevičienė, A. Bartminas. Blockchain-based connectivity within digital platforms and ecosystems in international business. *Journal of International Management* 30(3) (2024) 101109. DOI: 10.1016/j.intman.2023.101109.
- [35] D. J. Teece. Business models and dynamic capabilities. *Long range planning*, 51(1) (2018) 40-49.
- [36] J. Zhang, D. van Gorp, H. Kievit. Digital technology and national entrepreneurship: An ecosystem perspective. *The Journal of Technology Transfer* 48 (2023) 1077–1105. <https://doi.org/10.1007/s10961-022-09934-0>.