SOME REFLECTIONS ON IMPLEMENTING THE INTERNET OF THINGS WITHIN ROMANIAN COMPANIES

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Abstract

The purpose of this paper is to present a balanced and comprehensive evaluation of implementing the Internet of Things (IoT) within Romanian companies. This study will explore the fundamental theoretical aspects related to the definition and evolution of IoT, highlighting the specific factors of the national economy that favor or limit the adoption of new technologies. Furthermore, in the current research, the author examines major challenges that companies face in the process of integrating IoT into their current operations. The paper also illustrates the relationship between the IoT and the ability of companies to improve their internal processes, innovate and strengthen their position in the market, with a special focus on the dimensions of operational efficiency, cost reduction and increased flexibility. The main contribution of this paper is to provide an integrated perspective on how IoT is influencing the competitiveness of Romanian companies, starting from the premises offered by the global digital transformation. In the last few years, it can be notice that the number of organizations which have adopted IoT solutions in Romania has increased substantially, thereby confirming the trends of the global market and their desire to respond to market demands and increase the competitiveness of their products. Still, more organizations in Romania adopt IoT solutions, following the trends of the global market and increasing their solutions' competitiveness in order to respond to the market needs. Thus, this approach aims to emphasize that the implementation of IoT is not just a technical matter, but also a process of profound organizational change that needs a visionary leadership, strong partnerships and robust strategic planning.

Keywords: *Internet of Thimgs, digital transformation, romanian companies, digital technologies, smart devices*

Clasificare JEL: L60, M3, C02; C87; D11

1. Introduction

Nowadays, digital transformation has become a major concern for most economic sectors, driven by technological advancement and the need for companies to stay relevant in an increasingly competitive business environment. In this new paradigm, the Internet of Things (IoT) occupies an important place, promising not only significant operational optimizations, but also opportunities for innovation and diversification of business models. As the amount of data generated by interconnected devices grows exponentially, organizations are challenged to find efficient ways to collect, analyze and leverage the available information.

At the international level, the Internet of Things (IoT) has become a central topic of research and analysis with regard to digitization, being considered a driver of organizational transformation (Davies, J. 2019). In the Romanian business environment, the adoption of IoT is not limited to the acquisition of hardware and software technologies, but also involves strategic adjustments, the development of digital competences, as well as the updating of the organizational culture to integrate the new workflows generated by smart devices (Anderson, M. 2020). From this perspective, for Romanian companies, adopting digital technologies is not just a competitive advantage, but has become an essential condition for remaining relevant on the market. The digital transformation opens new ways to new markets, reduce operating costs and improves communication between actors in the value chain. This complex reality demands a multidisciplinary approach, integrating technical, economic, legislative and societal dimensions into a coherent vision of how IoT can enhance the competitiveness of companies.

2. Theoretical considerations regarding IoT in the context of digital transformation

The Internet of Things (IoT) is considered a defining element of the digital transformation, as it allows the interconnection and communication between physical devices, software applications and data storage and processing infrastructures, with the aim of optimizing the processes and increasing the performance in the global business environment.[2] In other words, this concept is distinguished from traditional technological solutions by the incorporation of smart objects, which are equipped with sensors and transmission capabilities, and thereby facilitate the continuous provision of relevant information regarding the state of systems and the environment.[3] Given that the international business environment is in the process of adopting the emerging technologies, the IoT is at the center of strategic initiatives aimed at reconfiguring production modes, distribution mechanisms and relationships between business actors from different sectors.

Furthermore, the large-scale adoption of the IoT is being facilitated by the convergence of several technologies, such as increased cloud storage capacity, access to high-speed communication networks and the development of artificial intelligence algorithms. In this framework, the connected devices are transferring their data to central platforms, where are analyzed and processed to generate operational knowledge.[4] In the global business environment, a data-driven approach is a key factor in enhancing competitiveness that allows companies to initiate continuous improvement processes and customize their products and services according to customer preferences. In the context of global competitiveness, digital transformation has made many companies to rethink their development strategies, by turning to the solutions centered on connectivity, data analytics and automatization.

Thus, the IoT becomes a catalyst for this process, facilitating the convergence between IT and operational technology and creating the new business models. In many sectors such as manufacturing, logistics and healthcare, connected things can improve process efficiency, cutting costs and accelerating the response time to consumer demands. From this perspective, in the service sector, continuous monitoring and the personalization of offers become more controllable by integrating data obtained from smart devices.[9] In other words, the IoT is a natural consequence of technological progress and a key element of the digital transformation, being designed to make organizations more competitive in an increasingly complex global economy.[8] By enhancing their ability to analyze and use real-time data, enterprises can more rapidly recognize new opportunities, more effectively respond to changes on the market and develop competitive advantages based on innovation and flexibility.

However, to fully capitalize on the potential of IoT, companies need to deploy robust security solutions, invest in employee training and adopt a strategic framework that combines technological resources with a clear vision of their future in the global business environment. While IoT becomes more and more influential in shaping the new digital paradigm, the decision-makers from global business environment are shifting their strategies towards investing in new capabilities to manage information generated by connected devices.

3. Some major challenges and risks regarding IoT implementation within Romanian business environment

Integrating IoT solutions within a business involves more than simply installation of sensors and configuration of a software platform. Thus, a paradigm change across the entire organization becomes necessary, so that processes can be redesigned and the data generated by smart devices can be exploited for the benefit of the business. Moreover, digital transformation involves certain risks and challenges that can be grouped into several categories, from cyber security and privacy to financial and organizational matters. One of the major IoT concerns is cybersecurity, because every device connected to the network is a potential access point for cyber- attacks.[9] In any IoT

infrastructure, the number of devices can be very large, that complicates vulnerability and security patch management. In addition, data collected by sensors may contain sensitive information about internal business processes or customer behavior, so any security breach can have significant consequences, including financial loss, damage of public image or violation of privacy legislation.

Another challenge is the complexity of IoT integration with IT systems of company. Most organizations have legacy platforms, established procedures and IT infrastructures that have been developed to meet current needs.

Also, implementing smart devices and data analytics platforms requires adapting these systems, and in some cases may even need to be replaced. Therefore, this process can generate significant costs and can delay the launch of IoT projects, especially when financial resources and technical skills are limited. From organisational perspective, the introduction of IoT can generate resistance to change, especially from employees who fear that automation and digitization could affect their jobs or lead to significant restructuring of duties.[5] Under these circumstances, to avoid these situations, is necessary a coherent change of management strategy, that includes staff training, a clear communication of benefits and the involvement of all stakeholders in phases of planning and implementation.

Without such approach, IoT projects risk being perceived as external initiatives, imposed by management, and may have internal blockages that compromise their effectiveness. Another important risk, especially for small and medium-sized enterprises, is related to the initial investments that are necessary to purchase equipment, develop software applications and secure the communications infrastructure.

Although, on the long term IoT can lead to cost savings and increased productivity, the amortization period may be considerable, especially if the project is not properly dimensioned. In addition, due to the accelerated dynamics of technological progress, there is a risk that the acquired devices and platforms to become outdated in a relatively short time, which can increase uncertainty and decision-makers' reticence to invest.[10]

Therefore, the risks and challenges of introducing the Internet of Things in Romanian companies reflect a complex reality, in which digitization efforts must be carefully coordinated to ensure sustainable results. Whatever it is a matter about technical skills, financial resources, digital infrastructure or compliance of legal regulations, each aspect requires a concrete plan and an integrated approach at strategic level. Thus, by assuming a clear vision and developing an organizational culture that is open to innovation, companies can overcome obstacles which are associated with implementing the Internet of Things, capitalizing on its transforming potential with the accelerated dynamics of contemporary economy.

4. Impact of IoT implementation on the competitiveness of Romanian enterprises

The effects of IoT implementation on competitiveness can be seen at both operational and strategic levels, where companies can consolidate their market position through a number of concrete benefits. Nevertheless, to understand better the importance of this phenomenon, it is necessary to distinguish between the direct impact, visible in terms of operational performance and indirect impact, which influences aspects such as innovation, organizational culture and relationships with partners. The direct impact is manifested mainly through the optimization of processes, which become more transparent and flexible thanks to the data flows generated by sensors. Moreover, this transparency allows for tighter control of resource consumption, the reduction of downtime and the anticipation of failures, leading to significant savings and the improvement of productivity.[11]

In the industrial environment, the real-time monitoring of equipment can help to adjust the operating parameters to maximize product quality and reduce waste, while in the field of logistics, the tracking of floats and the optimization of transport routes can reduce the costs and improve the

delivery time.[12] In addition, through IoT, can be developed new ways of interacting with customers, where feedback is collected and processed in real time. Against this background enterprises have the opportunity to adjust their services and promptly resolve any potential problems, contributing to increasing the satisfaction and loyalty of their customers.

Meanwhile, by continuously monitoring the usage behaviour of connected products, organizations can identify their unmet needs and quickly launch customized offers, which boost their competitiveness in highly dynamic markets. Otherwise, the indirect impact refers to the structural and cultural changes that IoT introduction implies within any organization. More than that, the data from smart devices can support new managerial approaches based on real-time decision-making and predictive analytics, which enhance the ability of innovation and adaptation to external changes.[13]

Also, by connecting all the departments into a unified flow of information, it is creating the conditions for the growth of internal collaboration and the emergence of cross-cutting projects that would capitalize the synergies between teams of production, sales, marketing and R&D. Another notable indirect effect is to strengthen the capacity to build sustainable partnerships.[6]. Thus, within IoT ecosystem, suppliers, customers and other stakeholders can access in real-time certain categories of data, facilitating the coordination of processes and improving the value chain continuity. In consequence, this interdependence can generate additional competitive advantages, especially when enterprises collaborate to develop innovative products or services that require the integration of skills and resources from different sources.[14]

While the benefits of IoT are numerous, the scale and duration of these benefits depend largely on the way where companies are able to manage the challenges of security, digital skills and financial investment. In the analysed context, IoT integration should be combined with a clear strategy, which should include short, medium- and long-term objectives and a development plan of human capital. In the absence of such an approach, IoT projects risk becoming isolated initiatives that have no cohesion and fail to produce noticeable changes in the organization's competitiveness.[15] Finally, the use of IoT in Romanian companies is both an opportunity for economic growth and a catalyst for digital transformation and modernization of business processes**.**

5. Conclusions

In general, IoT has become a major factor in the global economy and the Romanian business environment is not exception from this trend. Furthermore, the increasing accessibility of smart devices and the improvement of communication infrastructure have created the premise that many companies are orienting their strategy towards implementing IoT solutions. The arguments expressed in this study support the idea that IoT anymore just cannot be the exclusive appanage of big corporations. In progressive manner, smaller Romanian companies with limited resources have started to notice the potential of digitalization projects. However, to succeed, it is essential that IoT to be treated as a strategic process, integrated into the company's growth vision, rather than a punctual initiative driven by technological enthusiasm. A particular role in IoT expansion has public policies and the funding sources available through European and national programs. Also, it should not be forgotten that if these are linked to the real needs of companies, they can accelerate the digital transformation of the Romanian economy and can support competitiveness on the long term. Nevertheless, the simple existence of funds does not guarantee the success, but also requires technological skills, capacities of projects management and regulatory frameworks that encourage innovation and collaboration. Meanwhile, the development of human capital is one of the key factors that can maximize the benefits of IoT. Thus, without specialists who are capable to design, implement and maintain complex IoT solutions, the investments risk being under-performing or even becoming non-functional. In this regard, the collaboration with institutions of higher education, as well as the implementation of continuous training programs at company level, can

contribute to create a nucleus of essential skills required for a digitalized economy. Along with the technical and organizational aspects, IoT adoption must also be examined from a cybersecurity and data protection perspective. In this scenario, configuring a large number of connected devices would exponentially increase the potential of cyber-attacks and thereby the magnitude of associated risks. In the same manner, data collected by IoT can include sensitive information about internal processes or customers, which obliges companies to establish strict security policies and to ensure that they are respecting national and European regulations. In conclusion, the issue of IoT implementation in Romanian companies illustrates a series of key elements, such as digital infrastructure, professional skills, public-private collaboration and organizational culture, all contributing the increase of competitiveness and the development of a business environment adapted to the challenges of the 21st century. The long-term success depends on the ability of businesses to anticipate the market needs, to integrate technical solutions in a coherent manner and to develop processes to ensure that the data collected can be valorized. Thus, through a strategic and coordinated approach, Romanian organizations can overcome initial barriers and fully assimilate the benefits brought by IoT technologies, positioning themselves favorably in the global competition. Finally, this profound transformation of the way in which businesses are operating has the potential to inspire new business models, stimulate innovation and place Romania in a better competitive position on the international level.

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