Digital platforms and digital transformation

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Abstract

The paper focuses on two crucial aspects of the digital economy: digital platforms and digital transformation. These two topics play a significant role in shaping the modern business landscape and have implications across various industries.
Digital platforms, along with the related digital platform economy, and digital transformation lead to innovative business models and strategies that capitalize on the vast potential of the digital economy. However, the paper points out that digital transformation is not just about technology; it's also about people, processes, and culture.

Keywords: digital platforms, digital platform economy, digital transformation, disruptive digital technologies, digital innovation.
JEL Classification: O30, O39, M20, M13

Introduction

In this paper, we examine the topic of the digital platforms and analyze digital transformation.
Digital platforms, also known as multi-sided platforms, are regarded as special kinds of firms that facilitate exchange by allowing direct transactions between different groups of consumers who would otherwise be unable to transact.
Digital transformation is a disruptive phenomenon and is achieved through the use of up-to-date digital technologies and a forward-looking strategy. Digital transformation has important implications for businesses, including the emergence of new business models, innovative products and services, and enhanced customer experiences. This process entails a profound change, particularly a structural change within a company's organization.

1.1. Digital platforms and the digital platform economy

The emergence of digital platforms is an essential characteristic of the digital economy. A looser definition of a platform is where social and economic interactions are mediated online, often by apps. Michael Cusumano and Annabelle Gawer (2014) have shown that digital platforms are multisided digital frameworks that shape the terms on which participants interact with one another. These digital platforms are diverse in function and structure. The pioneers of digital platforms have disrupted industries like retail, travel, and mobility, as seen in the case of companies such as Amazon, Salesforce, and Uber. Google and Facebook are digital platforms that offer search and social media, but they also provide an infrastructure on which other platforms are built. Amazon Web Services provides infrastructure and tools with which others can build even more platforms. Airbnb and Uber use these newly available cloud tools to force deep changes in a variety of incumbent businesses. In fact, incumbent firms, or non-digital native companies, had to shape their platform and ecosystem

strategies to create value and stay competitive. Together, new innovative firms and incumbents are provoking the reorganization of a wide variety of markets and work arrangements.

Therefore, an important aspect of the digital revolution is the emergence of the digital platform economy (DPE). The term "digital platform economy" was coined by Martin Kenney and John Zysman (2016) as a more neutral term that encompasses a growing number of digitally enabled activities in business, politics, and social interaction. These authors were already realizing that the application of big data, new algorithms, and cloud computing would change the nature of work and the structure of the economy. Kenney and Zysman (2016), however, underline that the exact nature of that change will be determined by the social, political, and business choices we make.

It is well known that platform businesses are taking over every industry and have already become a part of our everyday lives, whether we realize it or not. They are involved in activities such as reading during our commute to work, borrowing money, and opening small businesses. This paves the way for radical changes in how we work, socialize, create value in the economy, and compete for the resulting profits (Kenney and Zysman, 2016).

The Digital Platform Economy has been 50 years in the making, with significant advancements in each decade since the 1970s. The 1970s witnessed the development of the microprocessor, followed by the personal computer (PC) in the 1980s, the internet in the 1990s, the smartphone in the 2000s, and cloud computing in the 2010s. These advancements have occurred sequentially and additively, signifying an evolutionary progression.

In the industrial economics view, platforms, referred to as two-sided markets, multisided markets, or multisided platforms, are seen as special types of firms that facilitate exchange by enabling direct transactions between different types of consumers who would otherwise be unable to transact. Indeed, a platform business can be defined as a medium that allows others to connect to it. Platforms are underlying computer systems that can host services, enabling consumers, entrepreneurs, businesses, and the general public to connect, share resources, or sell products.

When we refer to a platform business, we are referring to a business model (not just a technology infrastructure) that focuses on facilitating interactions among a large number of participants. These interactions can take the form of short-term transactions, such as connecting buyers and sellers, or they can involve the formation of longer-term social relationships, collaborations to achieve shared outcomes, or sustained efforts to accelerate performance improvement of participants by fostering faster collective learning. The role of a platform business is to provide a governance structure and a set of standards and protocols that enable interactions at scale, thereby unleashing network effects.

Traditional linear business models create value by taking raw material components as inputs and creating products or services to push them into the market for sale to customers. In contrast, the platform business model does not own the means of production; rather, it focuses on creating and facilitating connections. Many major technology firms can be viewed as platform-based businesses, and there are two primary reasons why digital markets give rise to platforms.

First, platforms facilitate matching by providing a structure that enables efficient matches, taking advantage of low search costs. Second, platforms enhance trade efficiency by reducing search costs, reproduction costs, and verification costs. Platforms and platform-based ecosystems create markets that were previously non-existent due to high costs. By minimizing the need for bureaucracy, platform organizations have been able to significantly reduce costs—such as search and information costs, bargaining and decision-making costs, and policing and enforcement costs—to nearly zero (Goldfarb and Tucker, 2019).

Furthermore, the costs associated with authority and power have been diminished by replacing bureaucracy with networks. Therefore, with significant computing power, advanced algorithms, and access to vast amounts of data, market transactions facilitated through multisided platforms have reduced the cost and necessity of hierarchy and hierarchical power. In the twenty-first century, market coordination is shifting from the visible hand of management to the digital hand of platforms.

Digital multisided platforms are a new type of businesses that disrupt various industries, including finance, communications, advertising, and operating systems, as well as internet-based industries such as real estate and transportation, as noted by Acs et al. (2021).

Many of these platforms operate as "matchmaker" businesses, specializing in efficiently connecting one group of users with another by reducing information costs. Network effects, also known as network externalities, play a central role in these platforms. In a digital multisided platform, market interaction involves a triangular set of transactions among three agents. In this platform type, sellers and buyers are not engaged in direct transactions; instead, they represent different "sides" of the platform, which brings together these two market actors.

Platforms leverage their digital and disruptive technologies to achieve significant growth, including the attraction of non-users. Large, successful platforms often deploy this growth strategy to develop new markets and introduce new products. This approach expands the platform to cater to unique needs, update the product and service offerings, and enables the firm to co-create value through partnerships with sponsors, interoperable platforms, suppliers, consumers, and complementary service providers.

Now, let's explore some features that distinguish platform businesses from traditional businesses, as there are several aspects that set them apart.

Firstly, platform businesses are intermediaries or matchmakers whose core competency lies in reducing or eliminating information costs. Secondly, platform businesses are driven by demand-side dynamics, meaning that users play a central role in the firm's business model. Accumulating users is critical for platform businesses as it enables the generation of quality matches and value appropriation. Digital technology is deeply embedded in the core value proposition and existence of platform businesses. In the last two decades, increased computing power and decreased computing costs have enabled a continuous stream of innovations in the IT sector.

Let’s examine the platform-based ecosystem. Firstly, the platform-based ecosystem is inherently global, with billions of users and millions of agents. Secondly, platform-based ecosystems are developed and nurtured not by regions or governments, but by platform organizations. Finally, ecosystem governance, including the rules for platform entry and guidelines for good behavior, is determined by the owners of the platform firms.

In a digital platform ecosystem, there are digital multi-sided platforms, digital users, and digital technology infrastructure. Digital users (consumers - demand side - and producers - supply side) connect to each other for economic and social activities through the internet and mobile devices on various digital platforms. Online participation requires a certain level of digital trust (e.g., user privacy) and digital proficiency (e.g., writing code, writing a movie review, rating a restaurant). Users should abide by the civic norms of the digital space and be discouraged from cybercrime.

An important component of the digital platform economy is the digital technology infrastructure. As digital technologies increasingly become more service-focused and socially embedded, an open, global, dynamic, and flexible view of digital infrastructure is needed to capture the effects of digitalization. Anchored in digital technologies, digital infrastructure is a socially embedded mechanical system that includes technological and human components, networks, systems, and processes that generate self-reinforcing feedback loops. Digital infrastructure does not have a single

defined set of functions or strict boundaries. Instead, multiple layers of systems and processes are at work simultaneously, resulting in a decentralized, shared, and distributed digital infrastructure that is not subject to the control of a single centralized stakeholder. Indeed, the control of digital infrastructure is distributed across multiple actors, such as designers, developers, and users. Thus, its governance is not an easy task. The open access and open standards of the internet allow anyone to develop and share applications. Digital infrastructure is constantly evolving and therefore represents a system that is never fully complete, but it can serve as an enabler for individual innovators.

Regarding the actors of the digital platform economy, two sets of actors, agents and users, populate the platform-based ecosystem on which multisided platforms rely for innovation (agents) and revenue (users). Specifically, platform owners populate the digital platform, while telecommunication service and equipment firms populate the digital infrastructure. The latter provide services to users, who in turn provide revenue to platform firms that facilitate the matching between the supply and demand sides of users. These digital infrastructure firms provide the hardware and software necessary to connect the global digital economy together. Supply-side users, which represent the largest number of firms in the platform economy, are non-technology organizations that include various merchants such as restaurants, Uber drivers, and self-employed individuals.

In particular, new technology-based firms are responsible for a majority of the innovation in the digital platform economy. They encompass IoT firms (hardware and software) and app developers.

The size distribution of firms in the digital platform economy is highly skewed, with a small number of very large firms, thousands of medium-sized firms, and millions of small firms (Acs et al., 2021). The digital platform firms are relatively small in number, but their reach is immense. Over the past seven years, we have witnessed the growing dominance of major hybrid platform companies. Hybrid companies, which have control over both innovation and transaction platforms, are fortifying their competitive advantages. Between 2015 and 2020, the number of digital platforms increased from around 50 to 150. Startups have played a crucial role across all categories of firms in the evolution of the digital platform economy.

The digital platform economy has several implications for the business ecosystem. This economy facilitates the development of the *sharing economy*, where consumers prefer to rent or borrow goods rather than buy or own them. An example of this is Spotify, a digital platform where users do not purchase individual albums or download songs but simply listen to them. In addition, platforms enable the on-demand economy, which reflects consumers' desire for immediate access to everything. Platforms can be accessed anytime a user wants. Finally, the platform economy also influences the *gig economy*, which refers to a shifting trend in employment towards shorter-term, contract-based work. The platform economy also affects this trend by providing technology that allows workers to work remotely.

1.2 Digital Transformation

The world, as we know it, is constantly evolving, and digital transformation is one of the key driving forces behind this change. At its core, digital transformation entails harnessing the latest technology to enhance existing practices and processes. In broad terms, digital transformation refers to the adoption of advanced digital technologies to revolutionize services or businesses. Thus, digital transformation revolves around embracing disruptive technologies to boost productivity, foster value creation, and enhance social welfare. Examples of digital transformation include the integration of Artificial Intelligence in banking, the emergence of cryptocurrencies, the development of digital cars,

and the utilization of robotics and automation in various industries. However, digital transformation is not just about technology, it's about people, processes, and culture too. The building blocks of a successful transformation include a clear vision, agile methodologies, data driven insights, and a willingness to embrace change. Digital transformation is no longer an option: it is the only possible choice for the future of business.

Digital transformation is a different phase with respect to *digitization and digitalization.* Digital transformation cannot be considered solely as a digitization of business processes or as making small changes to existing processes. It is not limited to using the latest technology and gadgets. Moreover, it is not confined to a single project, department, or line of business, nor does it represent a short-term tactic or one-time solution. Consequently, digital transformation goes beyond mere digitization and digitalization of business processes and encompasses broader transformations (Schilirò, 2022). Nambisan et. al. (2019) argue that digital transformation signifies disruptive implications of digital technologies for businesses: new business models, innovative types of products and services, and new types of customer experiences. Digital transformation marks a rethinking of how an organization uses technology, people, and techniques in pursuit of new business models and additional revenue streams. This change is driven by evolving customer expectations regarding products and services, as stated by Boulton (2021). The key elements of digital transformation are changing the business model, transforming operational procedures, and improving customer experience. Therefore, digital transformation entails a profound change, specifically a structural change, encompassing alterations in organizations, processes, and business models within firms, as well as shifts in consumer behavior. In this process of structural change, digital technologies can act as active catalysts in driving innovative activities. More specifically, digital transformation involves the integration of physical and digital components, standardization and automation, the presence of digital platforms, digital tools, and digital data, optimized data transfer, the development of digital business models, digital communication and social media, supply chain management, digital customer relationship management, and collaboration. In summary, the digital transformation process integrates and involves the entire ecosystem that is affected by it, promoting transparency, sharing and inclusion of all those involved.

In addition, digital transformation involves IT innovation aligned with business goals, encompassing both technological and cultural shifts, leveraging technology to add value, creating new business models and opportunities, serving as a fundamental and company-wide initiative, and requiring a well-planned, long-term strategy

Some scholars, such as Kane et al. (2015), Rêgo et al. (2021), and Warner and Wäger, argue that strategy, not technology, drives digital transformation and emphasize the key role of strategy in driving digital transformation.

Digital transformation is a multidimensional and multifaceted phenomenon that involves numerous business functions and necessitates a forward-looking strategy, as recognized by various scholars (e.g., Dąbrowska et al., 2022; Broekhuizen et al., 2021; Hanelt et al., 2021; Verhoef et al., 2021; Lanzolla et al., 2020). According to this perspective, the ability to digitally reimagine a business is determined by the presence of a clear digital strategy, supported by leaders who foster a culture of change and innovation. Digital transformation is an ongoing process of strategic renewal that leverages advancements in digital technologies to build capabilities that refresh or replace an organization's business model, collaborative approach, and culture. As such, digital transformation is inherently multidisciplinary, encompassing changes in strategy, organization, capabilities,

information technology, adoption of innovative digital technologies, significant shifts in the supply chain and marketing, and the cultivation of a different culture and mindset.

Additionally, new digital technologies blur market boundaries and redefine agent roles. Customers become co-producers, competitors become collaborators, and firms may even opt for vertical integration. Digital transformation is becoming increasingly inevitable across multiple sectors. While it is necessary, it should not be seen as an end in itself, as it entails significant changes and associated risks. In fact, these risks extend not only to economies but also to organizations. Therefore, businesses must carefully evaluate the decision to embark on a digital transformation, taking into account the available talents and capabilities.

The driving forces behind digital transformation encompass external factors such as digital technology, digital competition, and digital consumer behavior (Broekhuizen et al., 2021; Verhoef et al., 2021). Furthermore, the advent of new digital technologies has a profound impact on firms' cost structures. By replacing costlier human resources in service delivery with robots and virtual agents, optimizing logistic streams, and leveraging AI and blockchain to reduce supply chain costs, firms experience transformative changes. Competition is also undergoing significant shifts due to these digital technologies. Not only has competition become more global, but the influence of big, information-rich firms has intensified competition further. Simultaneously, consumer behavior is responding to the digital revolution. Consumers have become more connected, informed, empowered, and actively engaged. Consumers have increasingly come to rely on apps and AI-based technologies, which have become integrated into their daily lives. Consequently, these new digital technologies are expected to bring about structural changes in consumer behavior. With the advent of digital transformation, firms are engaged in fierce competition as they strive to achieve a competitive advantage through innovative business models. This transformation has been particularly pronounced with the growth of the internet, e-commerce, and the restructuring of the financial services industry on a global scale.

In summary, digital transformation occurs in response to changes in digital technologies, the rise of digital competition, and shifts in digital customer behavior. Therefore, firms aiming to undergo digital transformation must acquire digital assets, enhance digital agility and networking, establish agile structures with low hierarchy levels, and develop or acquire big data analytics capabilities. Digital transformation is a phenomenon with broad organizational implications. In the pursuit of digital transformation, firms actively search for and implement business model innovations. Therefore, digital transformation requires both technological and cultural shifts.

However, a crucial challenge in digital transformation lies in maximizing the benefits for businesses, consumers, economies, and societies at large. It is imperative to strike a global balance between effectively promoting the digital industry, facilitating knowledge creation and diffusion, while also mitigating the risks associated with a growing digital divide and protectionism (Schilirò, 2020).

The global economy is currently experiencing a rapid and profound digital transformation. The speed at which this transformation is taking place is astonishing. The profound consequences and exponential pace of digital transformation demand both local action and global leadership to reimagine development in the digital age (UNDP, 2022). Therefore, digital transformation is not just a concept; it is a reality that necessitates acceptance and adaptation.

The implementation of digital transformation has a profound impact on the business environment within the industry. For instance, it enables better value chain integration and facilitates the exploration of new markets, resulting in competitive advantage gains.

Several digital technologies have defined the new digital environment, particularly during the second decade (2010-2020) of the 21st century. These technologies include smartphones, mobile apps, artificial intelligence (AI), machine learning, cloud computing, big data, digital platforms, Internet of Things, robotics, blockchain, advanced realities, and digital twin, among others. These digital technologies have already brought about transformative advancements in numerous domains, notably revolutionizing service and manufacturing industries (Schilirò, 2022). Furthermore, the rise of web 3.0, characterized as a decentralized web ecosystem that empowers users to bypass internet gatekeepers and retain control over their data, has emerged. Its infrastructure, based on blockchain technology, is expected to introduce the era of the "token economy". Web 3.0 has the potential to be another disruptive element that contributes to digital transformation.

The emergence of new digital technologies characterizes the Fourth Industrial Revolution. The Fourth Industrial Revolution propels companies towards a new dimension known as "bimodal," as it encompasses an ecosystem of physical and virtual resources, where industrial production is highly automated and interconnected. Such a revolution implies that Industry 4.0 represents the next phase in the digitization of the manufacturing sector. Industry 4.0 is driven by disruptive trends, including the proliferation of data and connectivity, advancements in analytics, human-machine interaction, and improvements in robotics. Therefore, Industry 4.0 adopts several existing technologies, including robotics and networks, and effectively utilizes them in conjunction, resulting in a significant advancement in manufacturing capabilities. Furthermore, Industry 4.0 has four core principles: i) Interconnection: machines, sensors, devices, and people in the manufacturing process all connect and communicate with each other; ii) decentralized decisions: cyber-physical systems have the ability to make independent decisions and perform tasks autonomously; iii) information transparency: the manufacturing process allows for a comprehensive collection of data and information, enabling more informed decision-making; iv) technical assistance: improved technological capabilities of systems assist humans in decision-making, problem-solving, and handling difficult or unsafe tasks (Schilirò, 2022).

We can identify six technological areas that characterize digital evolution and enable digital transformation in the business environment, thereby facilitating the development of Industry 4.0.

Automation: The gradual automation of work has revolutionized work processes, resulting in increased speed, efficiency, and precision. Automation in businesses can achieve several objectives, including optimizing resources by automating complex and manual processes, accelerating service delivery by creating a dynamic digital environment with enhanced visibility and control, and transforming companies into efficient digital enterprises capable of meeting the ever-changing market demands.

Computerization: The advancement of hardware and software has introduced and enhanced a new level of intelligence in process management. Management literature has emphasized various approaches to designing computer systems and their social environments, which can fundamentally alter the nature and quality of jobs. Computer and information technology systems have gained increasing importance, especially during the Covid pandemic, as they facilitate flexible work arrangements by enabling employees to work remotely, either part-time or full-time. Digital transformation through computerization enables data-driven decision-making. Utilizing software solutions to automate processes provides greater visibility into the organization. These tools collect real-time data, enabling managers and entrepreneurs to identify patterns and seize opportunities.

Dematerialization: Dematerialization has triggered a virtuous cycle of information, promoting integration and collaboration among workers. Furthermore, the implementation of information and communication technologies (ICTs) can lead to significant reductions in material consumption by substituting virtual goods for physical ones, enhancing resource efficiency, and replacing resource-intensive sectors.

Virtualization: Thanks to advancements in software programming, physical resources can be transformed into logical resources managed through a centralized dashboard. Traditionally, applications were developed in a monolithic manner, where each application encompassed its own functionality, user interface, databases, and logic within independent stacks. However, when each application is associated with its own database, inconsistencies are likely to occur. Data virtualization, in particular, enables the provision of a common data source to all applications in the fastest and most efficient manner. Data virtualization establishes a single, real-time data access layer that integrates data from multiple sources without the need for replication. With such an architecture, applications can focus on their user interface and business logic, while the data integration tasks are handled by the common data virtualization layer. This approach enables the reuse of data across all applications, ensuring fundamental consistency.

Cloud computing: The transfer of hardware and software over the network has ushered in the era of pay-per-use and on-demand services. Cloud computing, in particular, where users access remote servers via a network, stands as one of the digital technologies that has significantly contributed to digital transformation and revolutionized contemporary business practices.

Mobile: Mobile devices have greatly enhanced individual productivity by offering increased availability and flexibility in the workplace. The proliferation of mobile devices and mobile internet has led to significant transformations in multiple sectors, introducing new audiences, services, products, and industries. The mobile landscape establishes the benchmarks for customer expectations in various digital domains. Since 2017, mobile has become a fundamental platform for all digital experiences, leading to substantial investments by global brands. Well-designed mobile apps play a crucial role in a company's digital journey, facilitating expedited digital transformation and delivering positive impacts for both employees and customers.

Let's examine automotive technologies as a paradigmatic example, where digital transformation is rapidly accelerating. Currently, a modern car integrates 50 to 120 built-in microcontrollers and is connected to a range of cloud and infotainment technologies through various external interfaces. The onboard software encompasses hundreds of millions of lines of code and continues to grow exponentially. Automotive software product lines and variants are among the largest and most intricate in the industry. It is often remarked that automobiles are swiftly evolving into "computers on wheels."

Successfully implementing digital transformation, however, is no easy task. According to a study by the Boston Consulting Group (2020), only about 30% of companies are capable of effectively undergoing a digital transformation. Additionally, Saldanha (2019) highlighted that more than 70% of digital transformations fail. A significant reason for this is the challenge of navigating through uncertainty, as new behaviors and expectations emerge and evolve at an accelerated, non-linear pace. However, in order to achieve digital transformation, companies must cultivate a culture that embraces change, experimentation, and continuous learning and improvement. To expedite the process, companies must also develop a clear vision for the future and steadily build the necessary technological and human capabilities to bring that vision to fruition.

Digital transformation, therefore, is a process that continually evolves, driven by the emergence of new frontiers in digital technology, which are anticipated to be even more disruptive. Consider the advancements in quantum computing or the adoption of quantum logic, enabling the simultaneous management of multiple algorithms. Many view quantum computing as the ultimate catalyst for accelerating digital transformation.

In fact, quantum computing surpasses conventional computing by leveraging counterintuitive principles of quantum physics to exponentially increase computational power. Imagine being able to solve complex problems in seconds that would take conventional supercomputers millions of years to crack. Quantum computing isn't merely an upgrade to conventional computing; it allows us to redefine the capabilities of computing.

Quantum computing has the potential to achieve tasks that are currently beyond our reach. For instance: It could facilitate the discovery of new medical drugs and vaccines by conducting molecular simulations that are currently unattainable with our existing computing capabilities. Quantum computing could optimize complex trading routes and supply chain logistics, thereby boosting global trade while simultaneously reducing climate emissions. By analyzing various molecular structures, quantum computing has the potential to uncover new materials, leading to transformative advancements in industries such as energy storage.

Currently, quantum computers have the ability to solve optimization problems, such as identifying the best outcome based on a given dataset. One potential application is enhancing efficiency and saving billions in global supply chain costs by identifying optimal routes. This is why investment in quantum computing has surged over the past decade. Therefore, quantum computing has the potential to play a significant role in digital transformation, as numerous industries recognize its capacity to disrupt the way the world operates.

Conclusions

This paper highlighted two important aspects related to the digital economy: digital platforms and digital transformation. These two topics play a significant role in shaping the modern business landscape and have implications across various industries.

In particular, digital platforms, which are online frameworks that facilitate interactions and transactions between different user groups, have disrupted traditional business models, providing new opportunities for startups and established companies alike. They offer scalability, low-cost entry, and access to a vast user base, making them attractive for businesses seeking growth and innovation. While digital transformation refers to the integration of digital technologies into various aspects of an organization's operations, processes, and business models, it involves leveraging technology to enhance efficiency, improve customer experiences, and stay competitive in a rapidly changing digital landscape. However, digital transformation is not just about technology; it's also about people, processes, and culture.

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