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Gianluigi Castelli
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The Post-Digital Enterprise

Going Beyond the Hype

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Foreword

The Post-Digital Enterprise: Contemporary, Disenchanted, and Oriented Towards Value Creation

Twenty years ago, the dot-com boom left a big mark in the history of economics and management. The genesis of the Internet had fueled a great season of birth and growth of new businesses and whole sectors; then, the bubble burst, and so seemed all the excitement around it. But it was only the beginning.

Soon enough, all business schools in the world, with SDA Bocconi in pole position, began asking themselves how much technology would have transformed business models and companies in the years to come. In retrospect, it is amazing to realize how disconnected the world was back then. People with a (weak) connection to the Internet were just over 300 million—5% of the global population—concentrated in 34 countries. Today, the Internet connects 4.7 billion people daily, with an incredible frequency and variety of interactions and in increasingly pervasive ways, which range from mobile devices to social media to virtual reality.

A quick glance at the global economy is enough to realize how much this change also impacted the corporate world. In the last ten years, the global ranking of companies with the highest market capitalization saw the downgrading of the more traditional and historically represented sectors (energy, oil and gas, retail trade, manufacturing) and the rise of the so-called big techs. The famous FAANG (Facebook, Amazon, Apple, Netflix, and Google) took the best seats at the table, deeply revolutionizing our lives in the meantime. And yet, the tech sector evolved so fast that the term FAANG itself is now obsolete, given that Microsoft surely deserved a seat at the same table, that Google and Facebook are now better known by their holding groups Alphabet and Meta Platforms, respectively, and that Chinese giants like Alibaba and Tencent have already joined the group as well.

While the evolutionary pace of big tech companies has been astounding, these have undoubtedly been years of great change for any other organization in the world. On a global scale, companies have seen their way of operating profoundly revolutionized (and still in a revolution, for many aspects). It is a change that has data and information at its core, including the ways in which these are collected and

analyzed, and the managerial and organizational implications brought by the new digital technologies. It is no coincidence, therefore, that information technologies (IT) have been at the forefront of this change. Today's IT projects bear little resemblance to those of the past; the latter were mainly aimed at obtaining technological efficiency (for example by reducing IT operating costs), while the former almost always require the organization to undergo a profound process of change management to capture the promised benefits. As early as 2004, the concept of techno-change (from technology-driven organizational change) was introduced (Markus 2004). Suddenly, IT projects were no longer limited to a single well-defined business unit, but rather open and extended to the entire organization. Digital has further reinforced this trend. Today, no unit within a modern organization can afford to neglect digital techs in its daily operations. Even more, innovation is increasingly found outside the traditional boundaries of the firm, deeply influenced by the connections that the organization manages to establish with its peers, stakeholders, and the environment(s) in which it operates.

For a school of management like SDA Bocconi, these elements nourish and stimulate the constant determination to be alongside students, managers, and entrepreneurs in these crucial moments of economic and social metamorphosis. Acting on people means acting on companies—of any size and sector—on institutions and public administrations. And it is precisely the most prepared people, companies, institutions, and administrations, equipped with knowledge and skills that allow them to face the great challenges of the contemporary world, who are best able to use resources and achieve their goals faster and more effectively.

The Post-Digital Enterprise goes exactly in this direction. The book collects over six years of research carried out by the DEVO Lab, the School's center of excellence for the study of digital technologies and their implications for organizations. The DEVO has always been a prime example of the school attitude to create and share knowledge—that is, in the specific case, of fully supporting organizations' managers in their digital transformation processes. It is no coincidence that one of the Lab's mottoes is *"to bring together multidisciplinary perspectives, experiences and backgrounds to consistently assess the business implications of digital technologies and the value generation they can enable."*

However, *The Post-Digital Enterprise* does not only look at the past and at the revolution that has already been, but also and above all—as the title already suggests—at a way of interpreting the future and at what will digital mean for organizations in the years to come.

As early as 1998, a revolutionary thinker such as the founder and then director of the MIT Media Lab Nicholas Negroponte predicted that the future would be "Beyond Digital" (Negroponte 1998): a future in which *"…Computers will be a sweeping yet invisible part of our everyday lives: We 'll live in them, wear them, even eat them. […] Face it—the Digital Revolution is over."*

Negroponte was certainly ahead of his time, and even if the digital revolution for him ended as early as 1998, it certainly took the rest of the world longer to realize it. But ultimately, the hidden meaning of his words remains true: over the years, digital entered pervasively into our lives—and as a consequence, into that of

companies—so much so that today there is no human activity that has not been impacted by digital. Most of us, consciously or not, are truly living in a post-digital world.

And this is precisely why *The Post-Digital Enterprise* manages to connect the past and the future. On the one hand, the book examines and explores the great lessons learned from past mistakes to understand how to put them to good use. On the other hand, it provides readers with tools to understand what it means to adopt and exploit digital technologies in a post-digital world while at the same time dismantling many of the myths surrounding today's digital buzzwords. The book manages to do so by placing at the center of the analysis the enterprise: an entity that today more than ever must prove to be *contemporary*, with respect to the many technological challenges it will have to face; *disenchanted*, with respect to the many empty promises offered by the digital world; and oriented towards a healthy process of *value creation*, which always remains the cornerstone of every economic organization.

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“The editors are grateful to the DEVO Lab Founding Members that supported the research initiatives of the Lab since its establishment in 2015.”

Contents

Companies and Digital Transformation

Aakanksha Gaur

Abstract

The prevalence of digital technologies is luring organizations to transcend into the digital firm. While the idea and the notion of the digital firm seem attractive to many traditional firms, embarking on this journey brings a plethora of challenges due to the disruptive nature of digital technologies. The chapter underscores that even though digital technologies lead to value creation, in many cases their adoption in firms is driven by hype and competitive pressures. We provide evidence for this by discussing how a flurry of digital startups has emerged over the past years, but a lot of them do not scale up. The chapter describes what a digital firm is and discusses the challenges legacy firms encounter in transitioning to a digital firm. The chapter discusses how traditional businesses need to address several issues such as appropriate organizational structures, change management programs, managing digital talent to be able to extract value from their digital transformation programs.

1 Tracing the Genealogy of the Digital Firm: From the Information Era to the Post-digital Era

Understanding the information era or the digital age serves as a prelude to comprehending current developments. The information era is the period starting in the 1960s with the introduction of the personal computer, with successive technological innovations introduced to allow the transfer of information freely and quickly. The information era saw many landmarks in terms of technological revolutions. From the launch of the pager and APRANET network during the

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1960s–1970s, the launch of the first mobile phone and digital camera, and the invention of the world wide web in the 1980s, to the introduction of Bluetooth, dial-up Internet, and the roll out of e-commerce and social media sites during the 1990s–2000s, a multitude of innovations in the ICT sphere were made during this era.[1] The information era comprised three main phases: the data processing phase that ran from 1960 to 1980; the Microcomputer (Micro) phase dated from 1980 to 1995; and the networked phase, which began around 1995 and continued until 2010 (Nolan 1998).

During the data processing phase, computer systems were large and had significant electromechanical components including peripheral devices for input, output, and storage. The first applications of computers were in the scientific domain, for national defense purposes; the first commercial applications generally included accounting and automated tasks such as payroll and general ledger processing. In the Microcomputing phase, companies invested heavily in the automation of factory tasks such as maintaining a bill of materials, inventory control, and production scheduling. Databases emerged as an important technology for managing the data used in integrated applications, and data administration also evolved to identify the activities necessary for rudimentary information resource management. This phase viewed the computer as more than a machine to automate or informate low-level tasks within a firm (Zuboff 1988). It viewed the computer as a technology that could make managers and workers more productive.

The transition to the third phase, "the networked phase," was preempted by the increased usage of personal computers in firms, resulting in an uncoordinated management of PCs and subsequent inefficiencies in business processes. Thus, the notion of networked computers came into being. IT-enabled network organizational structures smoothed the implementation of advanced business strategies that stretched *"making and selling" products and services to "sensing and responding" to individual customer needs in real time* (Bradley and Nolan 1998).

In summary, Information and Communication Technology (ICTs) implementation in companies during the information era took place in two upswings: one focused on computers and factory automation and a second focused on communications and Internet infrastructure. The early history of ICT was characterized by high assembly costs and insufficient memory space, resolved, for example, through the integrated circuit. The Information Age was primarily driven by automation and computerization, thereby resulting in higher productivity, coupled with a net job loss in manufacturing (Taalbi 2018).

The jump to the current post-digital era has been driven by, inter alia, an increased adoption of digital technologies. Consider this, less than 1% of the world's technologically stored information existed in digital format in the late 1980s, whereas in 2012 this stood at close to 98%. In the 1960s, it would perhaps have been beyond imagination that digital devices, or more specifically machines, would replace print media and newspapers, give us recommendations on where to eat and

[1] https://stfc.ukri.org/files/digital-revolution-infographic/

directions for how to get there, and even converse with us. Once unconceivable, these things now form an intricate part of our lives. And yet today there are several compelling reasons to believe that the "Digital" is passé.

2 The Digital Challenge and the Desire of the Digital Firm Paradigm

The era of Digital Darwinism demands organizations contest an unpredictable future due to the fast pace of technological change and social evolution. As the rapid proliferation of information technology (IT) continues to reshape the infrastructure and operations of enterprises, the plethora of opportunities generated by the low cost of producing information and the pervasiveness of digital technologies have created the environment for a fully digital firm. Laudon and Laudon (2018, p. 11) define the digital firm, "as the one in which nearly all of the organization's significant business relationships with customers, suppliers, and employees are digitally enabled and mediated. Core business processes are accomplished through digital networks spanning the entire organization or linking multiple organizations." A digital firm relies heavily on both information and digital technologies to enable, mediate, and streamline its internal and external operations. Thus, a digital enterprise can also be considered, "an organization that uses technology as a competitive advantage in its internal and external operations" (Rouse 2011). Siemens (2019) defines a digital enterprise as "a business that has completed a digitalization strategy (aka, digital transformation) to fully incorporate digital tools and technologies across all aspects of their operations, from ideation through realization to utilization."

Digital firms sense and respond to their environments far more swiftly than traditional firms, giving them more flexibility to survive in turbulent times. Digital firms are also known to be more nimble, profitable, competitive, and efficient than traditional firms. Given these obvious advantages, becoming a digital firm is no longer viewed as a choice but an imperative for all companies across all industries. In the race to emerge and transition from being a legacy business to a digital firm, enterprises have raced on the path of digital transformation. However, unlike the Internet-based businesses that required the setting up of a website and the producing of information at low costs, a digital firm needs to be nimbler and customer-driven, making its trajectory a much steeper climb.

Nevertheless, firms have been quick to jump towards their digital dreams. Some firms have started leveraging the growing arsenal of digital tools available to access customers and deliver products and services from their core business. Others have embraced digital business models to incorporate new ways of working, enhance the customer experience, and redefine their industries in their entirety.

Despite a flurry of digital initiatives intended assist with the transition to digital firm status, transitioning from being a legacy organization to a digital enterprise is extremely difficult and remains cumbersome for most legacy companies. The success rate of those who have bridged the digital chasm is rather disappointing, with statistics revealing that only one out of eight firms manage to get their digital

transformation process in place. According to Rogers (2016) close to 84% of the major Fortune 500 companies fail at digital transformation. The MIT Center for Information Systems Research (CISR) found that only 28% of established companies have successfully digitized (Ross 2020).

Transitioning from being a legacy business is a bumpy ride, marked by significant challenges. An initial challenge is related to legacy norms and processes. Legacy businesses, over their history, develop strong norms and cultural mores that become the very identity of the organization, something that leaders and employees find difficult to let go. Leaders and employees alike closely associate themselves with the way things are done and often struggle to accept any deviation from the established business norms. The second challenge relates to "technology debt," i.e., poorly implemented, integrated, and architected technology, which is another barrier that impedes the transition to being a digital firm (Suer 2018). Owing to these challenges, the desire to emerge as a digital firm remains a distant reality.

3 Current Trends and Mapping Value Beyond the Hype

Digital technologies have amassed a lot of hype-driven momentum over recent years. Glance at any newspaper, magazine, or journal and you are likely to come across at least one article on how digital technologies have profoundly impacted business activities, decrying how "robots are taking over business activities" and "virtual reality is shrinking the physical gap across locations." Meanwhile, firms that use these digital technologies make grand claims for adopting these technologies, explicating how these bring about significant advantages to their businesses even as they continue to obfuscate any real value generated beneath a marketing hyperbole.

To better understand the volume of hype these digital technologies have generated, we adopted the approach by Gandomi and Haider (2015) wherein they used a keyword search to examine the hype generated by the big data technologies. Following this approach, we looked at the historical trends for the keyword "digital technologies" in publications. This helped us to understand how frequently the term "digital technologies" has been used. We conducted a keyword search using the term "digital technologies" on the "Scopus" database (restricting our results over 10 years 2010–2020 and to publications in which the term appeared either in the title, abstract, or in the keywords). Based on the query, we found a total of 146,552 papers during the period 2010–2020. We refined the query to examine the publications wherein the terms "artificial intelligence," "augmented reality," "virtual reality," "big data," "cloud computing," "blockchain," "robotics," "Internet of Things," or "3-D printing" appeared either in the title, abstract, or in the keywords. The query returned a total of 1,015,740 papers over the period 2000–2020. Figure 1 below depicts the number of publications that contained these terms over the period 2000–2020.

The numbers represented in Fig. 1 provide just one way of looking at the hype digital technologies have generated among practitioners and academics. The trend is further confirmed by the investments that are being put into these digital

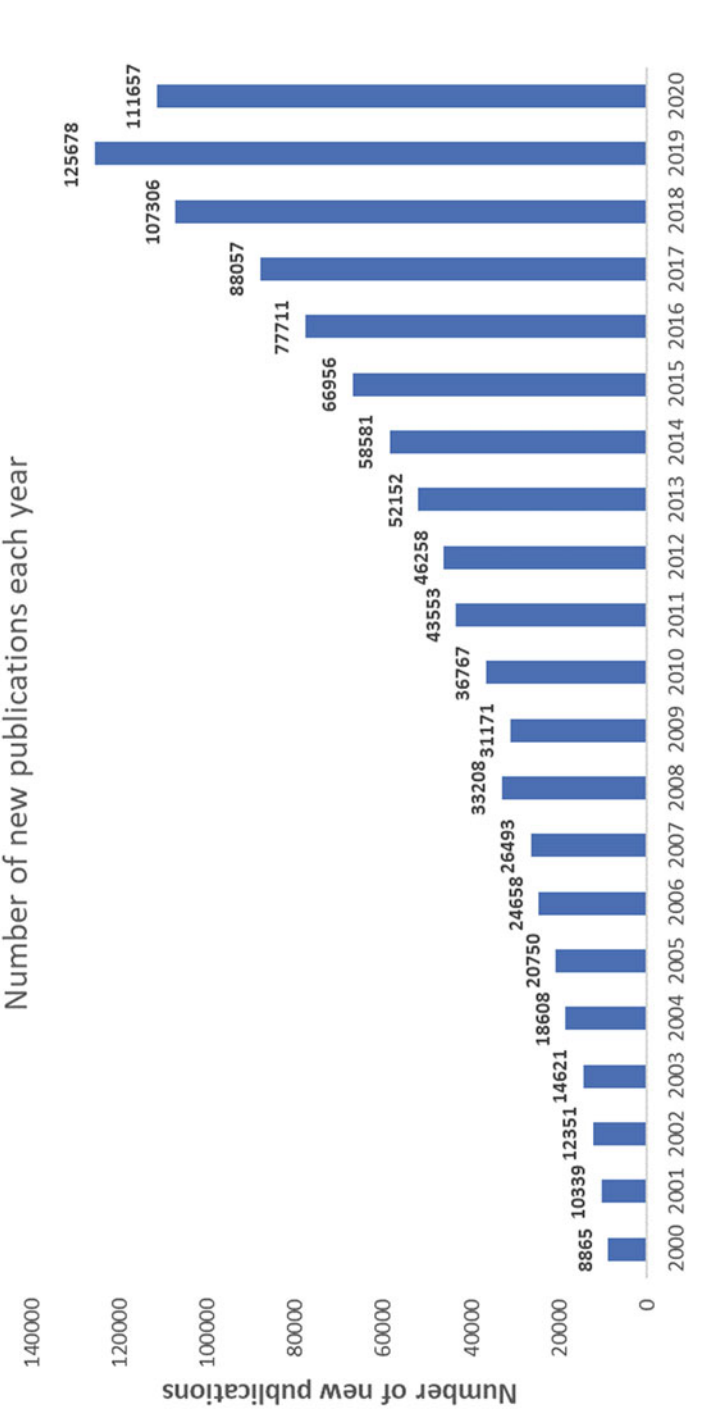

Fig. 1 Number of publications containing either of these terms: "artificial intelligence," "augmented reality," "virtual reality," "big data," "cloud computing," "blockchain," "robotics," "Internet of Things," or "3-D printing" over the period 2000–2020

technologies. For example, the worldwide spending on Internet of Things (IoT) by 2023 is expected to reach $1.1 trillion (Statista 2020). Similarly, global spending on artificial intelligence is forecasted to reach more than $110 billion in 2024 (IDC 2020a). Estimates suggest that spending on blockchain solutions will continue to grow in the coming years, reaching approximately $18 billion by 2024 (Liu 2020). Similarly, worldwide spending on edge computing and 5G is expected to cross $250 billion and $5.7 billion, respectively, in 2024 (IDC 2020b, 2021). These estimates reflect the huge volume of investments being made into emerging digital technologies.

Just as is the case today with digital technologies, the early days of the dot-com era also produced a lot of hype, buzz, and uncertainty. Companies thought they had to do something, and fast. This hype around technologies led to expensive and unfocused efforts that did not necessarily generate any tangible benefits for the companies. Once the hype settled down, they were able to proceed with more clarity and with thoughtful, meaningful strategies that leveraged the Internet's true capabilities to evolve their business models. There is a similar pattern in what we are witnessing now. The diffusion of digital technologies—for example, artificial intelligence, blockchain, cloud computing, digital platforms, virtual reality, and many others—has enabled a hype-driven adoption in which firms do not have clarity on the purpose of the adoption of these technologies. The rampant and hype-driven promotion of particular technologies (blockchain, artificial intelligence, virtual reality, 3-D printing) creates a burden on leaders to succumb to digital fads: making investments in the emerging technologies, without understanding which areas of business they are likely to fit into.

There is little doubt on the potential economic value that digital technologies could generate. The European Commission, for instance, forecasts that by 2030, the cumulative gross domestic product (GDP) contribution of new digital technologies could amount to €2.2 trillion in the EU-28 (EU-27 and the United Kingdom), a 14.1% increase from 2017 (European Commission 2020). Capturing this value requires firms to look beyond the hype and vouch for the adoption of digital technologies that are driven by needs and objectives (Grebe et al. 2017). Identifying specific use cases in which digital technologies can deliver tangible and measurable benefits will be the key to creating and capturing value through emergent technologies.

4 The Rise of the Digital Startup Economy

In the late 1990s and early 2000s, prompted by the potential of the Internet to reduce the time for customer outreach, reach vast numbers of customers from all corners of the world, reduce information asymmetries between buyers and sellers, and lower the costs of conducting business transactions, hundreds of companies leaped into existence (Varian 2016). But, starting in April 2000, Internet-based businesses (in colloquial terms also knows as "dotcoms") began to go bankrupt. According to Webmergers.com, 225 Internet companies failed in 2000 and 537 failed in 2001, an

event popularly known as "Dot-com busts" (Rovenpor 2003). A decade later, many of them sunk into oblivion. However, some survived and went on to be celebrated as unicorns.

A similar phenomenon has been unfolding in recent years. New digital technologies have engendered a new wave of tech startups. Digital technologies (particularly SMACIT: social, mobile, analytics, cloud, and Internet of Things) have transformed entrepreneurship by enabling the creation of new digital ventures. Consider how companies such as Airbnb, Uber, Facebook, and Amazon have risen to prominence, building and maintaining their businesses based on digital technologies. Companies such as N26 and Monzo have entered the banking industry and established themselves as digital banks. New ventures such as Deliveroo and Supermercato have emerged as grocery and food delivery platforms. The health sector is also brimming up with several digital startups (e.g., Ginger, Nference), 22 of which raised over $50 million in 2020 (Adams 2020).

Clearly, with the opportunities posed by new digital technologies, many new digital startups have emerged. Seven out of the top 10 largest companies in the world are in the technology sector and 2019 saw close to $300 billion in venture capital investments around the world (Startup Genome 2020). Tech investments represented 78% of venture capital investments in 2019 and 74% in 2018 (Lee 2020). In 2020, total venture investment in European technology startups stood at approximately $41 billion. Still, that amount is far behind the $141 billion that venture capitalists have poured into US technology startups or the $74 billion that has been invested in Asian tech startups (Kahn 2020). Despite a flurry of investments, the survival rates of these tech startups remain dismal. For example, 70% of upstart tech companies fail, usually around 20 months after first raising financing. For consumer hardware startups, the success rate is abysmally low with 97% of startups eventually dying (CBInsights 2020).

So why do so many tech startups flame out? Evidence shows that startups launch products that have no need in the market and that they are too focused on their product or oriented too much towards "getting their hands dirty" with digital technologies rather than on identifying ways their solutions can address real customer needs (CB Insights 2019). Startups that fail often do not spend enough time talking with customers and eventually end up rolling out features that were not viewed as beneficial by customers. Instead of imbibing a customer-obsessed culture, startups too dangerously concentrate on tech-obsession. Least surprising, they fail to reach a critical mass of customers who are willing to adopt their products and services. To drive higher adoption rates, tech startups should reconcile themselves to the fact that that adoption is not a mere technological but a socio-technological phenomenon. Consumers willing to adopt these services offered by technology startups should perceive the services as useful and easy to use and thus express the intention to accept the products and services offered by tech startups (Venkatesh and Davis 2000).

5 The Challenges of Digital Transformation

Despite the increasing acknowledgment of the need for digital transformation, the process is plagued with several challenges that impede its implementation (Willmott 2013). The subsequent chapters discuss these challenges in detail.

Digital transformation has seen increased commitment from organizational leaders. In a recent survey of US and European business and technology decision-makers, approximately three-quarters said their organization had undertaken a digital initiative (Adams 2020). Despite the investments, many organizations continue to struggle to translate the execution of digital transformation programs into tangible impact and benefits. Business leaders responsible for defining and executing digital strategy are being incessantly pressured to digitize their company's business model and achieve digital maturity (Gurumurthy and Schatsky 2019), yet they lack the knowledge and guidance to achieve concrete results.

Digital transformation is about more than implementing discrete technologies. Rather, it necessitates the development of a broad array of technology-related assets and business capabilities, which we call the post-digital principles, that can help propel an organization along the journey to becoming a post-digital enterprise. In chapter "Disruptive as Usual: A Manifesto for the Digital Age", we elucidate the post-digital enterprise and offer a manifesto that contains a series of key principles and recommendations for how to manage and organize a post-digital enterprise. The post-digital manifesto is a set of principles and practices for orchestrating and managing the post-digital enterprise.

In chapter "Redescovering the Fundamentals of Value Creation", we move on to uncover the reasons behind the failures of many digital transformation programs. Plenty of cash is poured into digital initiatives at large industrial companies. A survey of executives from 1350 global businesses reported investments in digital technologies amounting to approximately $100 billion between 2016 and 2018, and most of the leaders stated poor returns on their digital investments (Sutcliff et al. 2019). Of the $1.3 trillion that was spent on digital transformation in 2018, it was estimated that $900 billion went down the drain (Tabrizi et al. 2019). This begets the question, why do some digital transformation initiatives succeed and many others fail? There is enough evidence to convince us of the reasons behind unsuccessful efforts by organizations to scale digital innovations beyond early pilot work. Numerous studies have highlighted issues such as unspoken disagreement among top managers about the goal, lack of vision and digital strategy, misalignment between digital and business strategies, resistance to a digital mindset, and other institutional challenges (Fitzgerald et al. 2014; Kane et al. 2017; Westerman et al. 2014). Chapter "Redescovering the Fundamentals of Value Creation" digs deeper into some of these reasons and elaborates on many more to understand why so many digital transformation programs fail to scale up.

In the rush to run parallel digital programs, the usage of terms such as "digitization," "digitalization," "digital innovation," "digital disruption," and "digital transformation" has also ignited debate on origins and the semantic meaning of these terms, adding to the confusion surrounding them. This distinction is not a merely

semantic one; the reality is subtler. These terms have become a kind of hyped and overused concept that leads to an obfuscation of the underlying meaning. What's more, since the terms have often been used interchangeably, there is a lot of ambiguity around their meaning and origins. There has been some recent dialogue regarding the definitions of digitization and digitalization (Bloomberg Jason 2018). However, the confusion persists. Thus, it is paramount to understand the distinction between these terms and to distill their meanings before diving into the digital transformation of business (Schallmo and Williams 2018). Chapter "Redescovering the Fundamentals of Value Creation" clarifies these terms and explicates their respective meanings with concrete examples. Finally, chapter "Redescovering the Fundamentals of Value Creation" illustrates the concept of value creation and value destruction in the realm of digital technologies. It highlights the notion that digital creates value but that, if implemented incorrectly, it could destroy value.

In chapter "Competences and Capabilities for Digital Value Creation", we examine another important yet overlooked element of digital transformation endeavors: Reshaping skills and competencies in the post-digital era. The biggest hurdle most enterprises face in the process of digital transformation has little to do with technology and much to do with human capital. The skills gap, which can also lead to resistance from employees, is a major challenge that businesses face in the digital transformation process. Businesses need digital skills not just in marketing and sales but, increasingly, in operations and across the whole value chain. Finding and attracting talent can be a difficult task. A study by PwC reveals that one in three jobs is likely to be severely disrupted or to disappear in the next decade because of technological change, thereby impacting almost half of all low-skilled jobs and one-third of semi-skilled jobs (Attard 2019).

The World Economic Forum estimates that up-skilling the 1.37 million workers in the United States whose jobs are threatened will cost $34 billion in itself—or $24,800 per person (Centre for the New Economy WEFC, (BCG) SBCG 2019). OECD estimates suggest that 14% of jobs in OECD countries are at a high risk of automation (OECD 2019). Another study highlights that one in three jobs is expected to be severely disrupted or to disappear in the next decade (Attard 2019). Attard (2019) surveyed 1500 respondents from the private and the public sectors across regions and industries and found that 62 percent of executives iterated the need to retrain or replace more than one-quarter of their workforce between now and 2030 due to automation and digitization. Chapter "Competences and Capabilities for Digital Value Creation" addresses this crucial aspect of skill and competency development and discusses strategies to reshape skills and competences and bridge the skills gap in the post-digital era.

Chapter "Enterprise Renewal and Change Management" illustrates the significance of change management in response to the institutional challenges brought about by digital transformation programs. Digital transformation is not just about technology, it is as much about people, processes, and culture; not dealing appropriately with these issues is likely to result in failed transformation projects. Changing long-established cultural norms and legacy processes is a mammoth task, and as

digital transformation progresses, these could pose an impediment to the journey. Consequently, undesirable outcomes such as lack of enthusiasm, poor participation, or unjust expectations set in, and leaders and employees feel less eager to experiment further with digital initiatives. Therefore businesses often tend to suffer from what is termed "digital fatigue" or "digital frustration" (Tardieu et al. 2020). A recent study has pointed out that change management plays a critical role in driving successful digital transformation outcomes (Lindsay et al. 2018). However, many change management strategies do not yield the anticipated benefits because outdated models and change techniques are deeply misaligned (Ewenstein et al. 2015), especially when we consider these strategies in the context of the post-digital enterprise.

Anecdotal evidence suggests that the attitude of older workers who often tend to be averse to new ways of working and reluctant to learn about new technologies and their benefits impedes the successful digital transformation of many businesses (Fitzgerald et al. 2014). Employees often perceive digital transformation to threaten their jobs, and thus may resist the changes, even inadvertently. Digital initiatives span various divisions and require the active involvement of multiple departments, so it is paramount for all departments to work together to capture the resulting benefits. Because digital transformation produces a major impact on how people work, it is essential to anticipate staff concerns and build a persuasive case for employees to adopt digital technologies and participate in the transformation process (Caylar 2016).

Organizations that seek digital transformation often bring on board outside consultants as change management experts who tend to apply one-size-fits-all solutions in the name of "best practice" (Tabrizi et al. 2019). But an alternative approach has emerged on this front, which emphasizes relying instead on insiders and employees who have intimate knowledge about what works and what doesn't in their daily tasks, but who might not be as receptive to change. Thus, it becomes even more necessary to devise a change management plan that is aligned with the overall business and digital strategy. In chapter "Enterprise Renewal and Change Management", the book provides a set of change management strategies and actions that are well-suited for the post-digital enterprise.

Finally, chapter "Enterprise Renewal and Change Management" debates an important yet often ignored dimension of the digital transformation: an appropriate organizational design and structure in the digital and the post-digital era. Nowadays, digital technology makes it possible for members of an organization to self-organize and thereby avoid the delays, distortions, and other damaging effects of hierarchically organized systems (Ewenstein et al. 2015). Digital technologies, however, often disrupt established ways of organizing and require adaptation through collaboration as well as self-organization around situational awareness (Snow et al. 2017).

An outcome of the increased usage of digital technologies is the phenomenon of digital exhaust. Digital exhaust is defined as the metadata or by-products generated from the logs of employee behavior while they conduct activities like setting up a meeting or running calculations over digital channels or tools (Leonardi 2021). Digital collaboration technologies create a historical record of what employees are

saying and engaging in, and allow an organization to measure things like the collective mood of employees. For example, Gitlab, a fully remote organization, has constructed a small vocabulary of emoticons that are specific to the company's culture for employees to use. The company asks employees regularly to share their current mood using emoticons, allowing business leaders to capture their employees' feelings and other cultural attributes (English 2021). By doing this, the company instills a sense of recognition and proximity in its employees. Given the importance of new organizational designs, enabled by digital technologies and their repercussions, chapter "Enterprise Renewal and Change Management" deliberates the key organizational models that facilitate change management.

Chief Information Officers (CIOs) are often tasked with determining how emerging technologies will make an impact on business and with assessing these technologies with a pragmatic outlook, not based on the hype surrounding the technologies. Chapter "A Tool for the Boardroom: The Devo Lab Hit Radar" introduces a practical, hands-on tool for managers and boardroom members to assess and evaluate the adoption of high-impact technologies: the high impact technology (HIT) Radar. The HIT Radar is an outcome of a structured process that is based on identifying the emerging technologies, analyzing them across different dimensions, and offering in-depth and practical guidance on a set of possible actions that executives can take with the technology under scrutiny.

While there are many frameworks to evaluate the intention to adopt and use technologies from an individual's perspective (e.g., technology acceptance model, technology readiness index) (Venkatesh and Davis 2000; Briggs and Buchholz 2019), a framework aimed at supporting top executives in a company's technology-related decision-making was missing. The HIT Radar serves as a reference framework to understand the dimensions (e.g., the level of technological maturity, the level of market investments, the organizational and economic impact, and the legal implications) with which a particular technology should be assessed. The tool enables readers to cut through the hype and grasp a realistic and holistic understanding of high-impact or emerging technologies.

In chapter "The Hit Radar in Action", we examine how emerging technologies such as blockchain, drones, and 5G have evolved in recent years. While some technologies such as cloud computing, drones, big data, and 3-D printing have matured or are close to maturity, several others like blockchain, artificial intelligence, and quantum computing have yet to prove their mettle. Big data analytics and cloud computing, for example, have evolved from promising innovations into fully fledged mature technologies, and are now considered foundational components of enterprise IT architecture and corporate strategy (Briggs and Buchholz 2019). Some recent technologies that were lauded as revolutionary seemed to have stalled and are in danger of entering into oblivion. A few emerging digital technologies such as 3-D printing, IoT, robotics, and augmented and virtual reality are reaching important tipping points at which companies are beginning to see the impact of their adoption more clearly. Other technologies such as artificial intelligence, blockchain, 5G, and quantum computing are not there yet but are budding in importance. Chapter "The Hit Radar in Action" builds upon the high-impact technologies identified in chapter

"A Tool for the Boardroom: The Devo Lab Hit Radar" discusses the most recent developments that have occurred in this space. The chapter also describes which technologies have risen to prominence while others have crumbled and the reasons behind their respective ascents and descents.

In chapter "The Legal Side of Digital Technologies: Challenges and New Paradigms", we move on to the legal and privacy issues that emerge consequently to the implementation of digital technologies. Legal and privacy issues arising from technologies such as blockchain, artificial intelligence, Internet of Things (IoT), and other technological advancements in the digital era are reminiscent and comparable to the rise of the Internet in the 2000s. Contentious issues such as the regulation of digital platforms, decision-making by algorithms, data ownership and control, liquid surveillance, privacy in social networks, smart contracting, and cybersecurity risk raise major legal issues with the usage and implementation of digital technologies. Furthermore, privacy and security challenges posed by digital technologies are no longer restricted to private companies. Digital security and privacy protection have now become public policy priorities in today's digital economy and society.

Chapter "The Legal Side of Digital Technologies: Challenges and New Paradigms" delves deeper into these challenges and provides an overview of the major issues related to the impact of digitalization, interconnected networks, and artificial intelligence on contemporary law. It ends by elucidating the major legal issues raised by the advent of digital technologies.

Chapter "Enabling the Post-Digital Enterprise" concludes the book and discusses the guiding principles for managing the post-digital enterprise. Business leaders have to grapple with the idea of the "Post digital Era"—especially at a time when many are still struggling with transitioning to the status of a fully digital firm (Tinworth 2012). The phrase "post-digital" has been bandied about a lot over the past few years. For example, *The Guardian* writes, "Welcome to the post-digital world, an exhilarating return to civility. . . ." Deloitte inquires, "The Post-Digital Age: Is Your Enterprise Ready?" And Jefferies states ". . .we have certainly entered the post-digital era."

Despite every other digital expert launching a new definition of "the post-digital" enterprise, there is still ambiguity on the defining characteristics of the "post-digital" enterprise. Chapter "Enabling the Post-Digital Enterprise" clears away the confusion that has surrounded the term for years, as we discuss the quintessential features and the organizing principles of the post-digital enterprise. The chapter highlights that hoarding digital technologies is not the right approach for a post-digital enterprise; it is rather a conscious approach to the adoption of digital technologies that is the way forward. The concluding chapter chalks out a series of actions that a company needs to follow to truly emerge as a "post-digital" enterprise.

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Disruptive as Usual: A Manifesto for the Digital Age

Gianluigi Castelli

Abstract

The last 20 years have seen the birth and unprecedented successful growth of a new breed of digital companies. However, in the post-digital era, all companies, including the market leaders, are constantly under attack from new entrants that make a better use of digital technologies. The equation between digital technologies and value creation is not simple and should not be taken for granted. Many are the mistakes that companies can make when adopting digital technologies and more importantly, digital business models. In this chapter, a set of rules is drafted, in the form of a manifesto, to reduce the risk of failure while ensuring the necessary speed of change.

1 The Context

The last 20 years have seen the birth and unprecedented successful growth of a new breed of digital companies. This includes champions like Amazon, Facebook, Google as the precursors, and Uber, Netflix, and AirBnb more recently. It has also seen the reaffirmation of existing ICT companies that have substantially revised their business and commercial offer, like Apple, Microsoft, and IBM.

Many of these companies have also been able to collect an enormous amount of capital; seven of the eight top-ranking companies by capitalization are, in fact, digital companies (see Table 1).

The entrepreneurs who founded these companies were able expand their interests to a variety of other fields, thus increasing the impact of digital technologies. Examples of such expansions include space exploration (SpaceX), smart electric

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Table 1 The world's top 10 public companies by market value (Forbes Global 2000, 2020)

		Market value (billion USD)
1	Saudi Arabian Oil Company (Saudi Aramco)	1.685
2	Microsoft	1.359
3	Apple	1.286
4	Amazon	1.233
5	Alphabet	919
6	Facebook	584
7	Alibaba Group	545
8	Tencent Holdings	510
9	Berkshire Hathaway	455
10	Johnson & Johnson	395

and self-driving cars (Tesla, Google), and biomedical research (Google X Life Sciences).

Well-known evidence of the speed of changes and innovation confirms both Moore's Law (Moore and others 1965), which states that the number of components in an integrated circuit doubles every 2 years (or, if you prefer, that you get double the power for the same price every 2 years), and its extension by Ray Kurzweil's Law of Accelerating Returns (known as LoAR) (Kurzweil 2004). The LoAR states that every evolutionary process is exponential by nature and that as soon as a certain critical mass is achieved, this generates an accrued acceleration. In the case of the evolution of digital technologies, the convergence of several factors makes the exponent itself exponential. Several authors have predicted a technology singularity by the middle of this century (Kurzweil 2005; Brundage 2014), determining radical changes and disruption for companies, individuals, and, finally, for the economic system and society.

The exponential trend of technological innovation is a well-recognized historical phenomenon: the time between the invention of the internal combustion (IC) engine (1854), the first flight by an internal combustion engine (1903), the first supersonic flight (1954), and the first man on the moon (1969) demonstrates this. All these innovations grew slowly initially, and then their growth became exponential, both in terms of their domain of technology and their growing economic impact.

Even at the geopolitical level, we are observing deep and fast changes. This is not only because of the growing importance of raw materials like lithium, cobalt, nickel, and rare-earth elements. It is mostly because, in the context of global commercial exchanges, the ability to keep a high innovation rate has become a crucial requirement for the development and the economic well-being of communities and nations.

Support for technology innovation is at the top of the political agendas of governments of developed countries, but it is becoming a priority for all countries as the return on these investments is much faster than for all other industries.

The dramatic improvements of the three fundamentals of digital technology (i.e., the speed of data processing, data storage capacity, and the speed of data transmission) have made high-power portable devices of all kinds, intelligent sensors, and

complex algorithms globally available, enabling speech and image recognition, advanced robotics, and top class chess and Go AI players, to name just a few. Comparing the performance/cost ratio since the commercial introduction of the first microprocessors in the 1970s, we have seen improvements by a factor of millions.

Advances in processing and transmission speed, together with the availability of huge data repositories in a very small space, are the fundamental elements of the post-digital era. The dramatic overall improvement in performance, together with the convergence of digital and physical elements, breaks down the traditional distinction between material and immaterial and produces deep changes in all kinds of productive sectors, along all value chains and all production processes and consumer habits.

It is a new era of unexplored opportunities and possibilities. On one hand, opportunities that were unthinkable up to 20 years ago have opened up, making possible—to companies capable of seizing them—the achievement of exponential growth rates with very high returns in the face of reduced investments and low risks. Entire industrial sectors see demand and supply change completely: just think of the phenomenon of digital intermediation (Hawkins et al. 1999; Langley and Leyshon 2017), which has enabled the so-called platform economy and has offered extraordinary income positions to those service providers who, simply by applying existing digital technologies, have been able to launch particularly innovative business models (Kenney et al. 2016). The most known examples of such digital intermediaries are Amazon, Uber, AirBnb, Expedia, and Booking, but a plethora of emulators have followed these front-runners and adopted or adapted the same schemes and basic technologies to other market opportunities.

The new digital intermediaries have supported and favored the transition from a logic of ownership of assets to a system based on the possession of the information necessary to use the assets themselves, profoundly modifying the sharing economy and creating a very clear distinction of roles and positions between those who, on one side, own the assets, produce the goods and the services, and take all the financial risks, and the digital intermediaries on the other side, who manage all the information and act as a privileged, and in some cases exclusive, channel connecting the customer and the actual provider of the goods or services.

Digital intermediaries do not own assets, bear a limited marginal cost for information management (e.g., low-cost, flexible, and scalable IT infrastructures like cloud computing), take a large margin of profitability (20–30% of sales revenues in many cases), and face minimal operational and financial risks. In many cases, they do not even own the servers that manage the information, nor even carry the cost of the instrument necessary for customers to use the services (usually a personal smartphone), nor the connection costs. Serving as a direct, cheap, efficient, and reliable connection between producers and customers, they cut out any other intermediary, coming to put an end to companies that were leaders in their sector.

The speed of change and the impact that successful newcomers have on established market leaders is well described by the Nokia case: in 2007 a picture of the (then) CEO, holding a Nokia flip-phone, appeared on the cover page of the November issue of *Forbes* magazine. The underlying title was an apparently rhetorical question: "Nokia: one billion customers—Can anyone catch the cell

phone king?" At that time, after years of constant growth thanks to a solid reputation for product quality, Nokia held more than 50% of the market share for mobile phones. It was difficult to imagine, even for Nokia's top management, that in less than 2 years, their share would have gone down to 40%, then to 20% in the following 2 years, down to a near-zero share in the following 3 years.

In the post-digital era, all companies, including the market leaders, are constantly under attack from new entrants that make a better use of digital technologies, either by creating new services or products or by offering existing ones at lower prices or with a brand-new user experience.

However, as we will see later in this chapter and the following chapters, the equation between digital technologies and value creation is not simple and should not be taken for granted. Many are the mistakes that companies can make when adopting digital technologies and more importantly, digital business models. Being non-digital, as well as being digital in the wrong way, pushes them quickly to the edge of the market until they disappear.

2 Changing the Mindset: Passing Through the Hype Cycle Curve

The digital technologies arena has always been prone to hype and excessive expectation. Perhaps this is due to several factors such as the immateriality of the technologies, the technical knowledge needed to really understand digital innovations, and the so-called commoditization of such technologies. In the end, hype produces a fashion effect that lowers the protections linked to common sense and economic rationality, even in the business community.

Digital innovation has been one of the key drivers of value creation since the adoption of the first microprocessors, but at the same time this turbulent innovation has not only destroyed value in a physiological way but also through the lack of "deep" thinking and understanding of the implications and limitations of these technologies.

The Hype Cycle model, well-studied and described (Linden and Fenn 2003; Fenn and Raskino 2008), and introduced by The Gartner Group, a research firm specialized in information systems and technologies, is particularly effective in explaining the risks, opportunities, and the most recurrent mistakes that typically accompany the advent of new technologies.

As shown in Fig. 1, the idea behind the Hype Cycle is that digital innovations go through a series of ups and downs in terms of expectations after their introduction, before stabilizing at a certain level of performance.

Even in its inherent simplicity, the model well exemplifies what has happened and is happening with digital technologies. What is surprising is how the Hype Cycle repeats, almost unchanged, for every new digital technology and how inflated expectations win over common sense and economic rationality. Are we really doomed to ride the hype cycle every time? What about the waste of economic resources and the resulting loss of credibility? And on the other hand, what are the

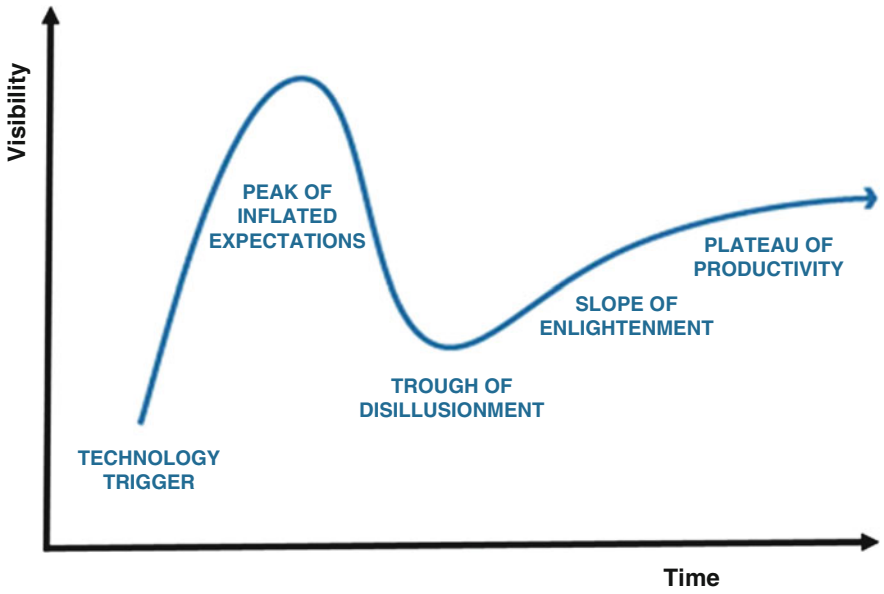

Fig. 1 Gartner's Hype Cycle Curve

risks of cutting investments in those technologies that are instead ready to produce real benefits in the long run?

The recent history of technological innovations and their effects on the economic system should suggest caution, but above all we need ways of separating substance from sensationalism. It is a question of spreading a new awareness about the adoption of technologies that can combine the forefront of digital opportunities with business needs and value creation.

The complexity of the variables at stake and the speed with which technologies evolve lead to errors of assessment with low-paying investments or adoptions of solutions that are not yet ready for prime time. Although, in some ways, it is true that learning through mistakes is sometimes quicker than understanding the right things, we still have to differentiate naiveness from bad judgment. There are therefore good reasons to make mistakes, like learning by doing when experience or references are lacking, but we still have to avoid the mistakes caused by mere unawareness and incompetence.

Even if there are good reasons, one often finds situations where an economic area needs to absorb a possible waste of resources, combined with a strong risk appetite: conditions rarely found in most companies. There are, however, errors that cannot be justified, even in the face of strong media and systemic pressure. The need to create a different awareness of new technologies is therefore born, but above all the duty to consider this interaction with the "new" is structural and no longer simply episodic.

This is a time of great opportunities, thanks to the formidable alignment of different digital technologies, as has happened in other fields in the past. The results

therefore depend on a profound reflection on the characteristics of technologies and their potential.

Some technological trends, such as Big Data (although we could also refer to Cloud Computing or the Internet of Things [IoT], which are also very popular today), exemplify what has been described.

What has happened regarding the so-called "Big Data" technologies configures a "perfect storm" of hype. Lack of knowledge and successful marketing have caused severe disillusionment, with the risk of missing the unquestionable, intrinsic business value of these technologies. How could this have happened? Initially we emphasized all the great advances in storage, processing capacity, and the potential leverage of intelligent systems capable of extracting knowledge from data. Subsequently, in spite of substantial technological results, we learned about a number of significant problems, such as data quality, the lack of contextual data (fundamental in social phenomena), regulatory and compliance issues (such as those linked to privacy), the investments necessary to access the most advanced tools, and the knowledge gaps in methods (e.g., statistics) and in the application domain (e.g., consumer behavior). Once again, we travelled on the hype cycle rollercoaster with the consequent waste of resources and the risk of throwing the baby away with dirty water.

Could this have been avoided? Maybe not always and under any circumstances, but we can definitely do much better in facing digital innovation. For example, it would have been enough to remember that data sources are quite different: social sciences are not as accurate as natural sciences and the number of errors increases as the variables considered increase (Taleb 2005). In companies, data have often been collected to trace phenomena different to the object of study, so that there are many measurement errors and inconsistencies in the data that make them unusable unless one makes strong investments in their integration and quality. None of these concepts is new or original, but hype strikes again and the whole Big Data movement has been affected by the hype syndrome and is still struggling to reach productivity and the value creation "plateau."

It is important to note that not even distrust and excessive prudence are correct attitudes, since the opportunities made possible by technological evolution and digital convergence are real and can actually generate deep and rapid changes. In the case of the IoT, the possibility of having processing capacity and connectivity at very low cost has led to the definition of almost infinite application areas: from home automation to the control of entire production plants, from interconnected appliances to a new generation of manufacturing machines, from drones for civil uses to the tracking of entire food chains. In the automotive industry, the advances in data processing, storage, and transmission systems (both in terms of costs and performance) have enabled the connection, in real time and without continuity solutions, of vehicles with surrounding infrastructures and other vehicles, as well as with the passengers on board and with any other authorized subject (e.g., insurance companies and bodies responsible for surveillance and security). The spread of advanced driver-assistance systems is very likely to precede a new generation of automated vehicles that will change our mobility habits and the mobility industry as

a whole (e.g., short- and medium-distance rail transport), and even the design of the road and parking systems of our cities.

Coming back to the Hype Cycle model, the suggestion is to find and promote a different path, a shortcut with two dimensions: first, to escape from unrealistic expectations and second, to give time to technologies to deploy their true potential.

"Cutting" through the curve (the green line), the hype-driven waste of resources, and at the same time, giving more opportunities to new technologies means their real potential in contributing to a steady value creation process (red dotted line) can be realized.

Escaping the hype and at the same time exploiting the incredible opportunities of digital innovation requires a mindset and a full set of principles and tools that will be outlined in the following paragraphs and then described more in depth in the following chapters.

3 A Manifesto for the Digital Era

The evolution of digital technologies has generated unimaginable progress and continues to create innovation and economic value for companies.

However, after more than 50 years of "disruptive" digital innovations, we can develop a mature approach: systematic, disenchanted, and at the same time receptive to all the technologies that can improve the competitiveness, the productivity, and the profitability of companies, together with their social and environmental sustainability.

The key question is how to build a virtuous path that, while maintaining enthusiasm and openness to novelties, might enable us to face the digital transformation without falling into the excesses of hyperbole. In other words, how to avoid the unsuccessful chasing of fashion effects, while remaining strongly anchored to the solid fundamentals of business economics and to the deep knowledge of the technologies underlying the various innovations. Figure 2 visually represents these concepts.

As you can see, the "cut" anticipates the exploitation of technologies and reduces the waste of resources. In the following paragraphs, we indicate a series of considerations that can help define a realistic and effective digital transformation path, in the form of a "manifesto."

3.1 Acknowledge the Key Role of Technological Competences

The availability of adequate technological skills is an essential condition for organizations to operate and grow in the post-digital era.

The intensity of innovation contributes to increasingly differentiate technological skills, making them more expensive and rarer in the acquisition phase, and more difficult to maintain, update, and develop.

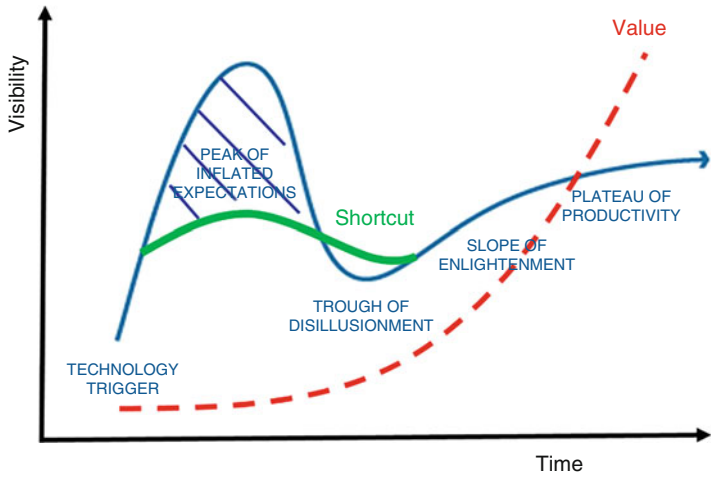

Fig. 2 A mature approach to the Hype Cycle Curve

Areas of very high specialization are created, and there are frequent cases of real leapfrog innovations, which require skills very different to those already possessed by the experts of the technologies previously in use. For example, the applications of new quantum computers could revolutionize some industrial and service sectors thanks to different data processing methods and the ability to quickly process classes of computational problems that would require very long processing times for traditional computers. As an example, optimizing the allocation of tracks to incoming trains is a non-linear problem; thus the computation time on even very powerful conventional computers would require a significant amount of time, making the algorithm useless in the real world.

Algorithms specifically designed for quantum computers, even in their limited form of quantum annealing, are able to solve the optimization problems of the reassignment of the tracks (so-called train platforming problems) in the case of unforeseen events like delays in departures and arrivals, or failures, in a few seconds. Thanks to their ability to execute algorithms for this class of problems in just a few seconds, quantum computers are able to identify optimized solutions, with less impact on delays. They can also manage the risk that emergency solutions may cause connecting passengers to miss the next train—or force them to walk excessive distances from one platform to the next, perhaps in a hurry while carrying their luggage—in a timely way. Unfortunately, the programming skills necessary to make the most of a quantum computer are very different to those typical of a traditional computer, programmed by an imperative programming language. This means that a lot of the knowledge and skills, built over the past 50 years, must be deeply revised and updated through extended (and expensive) re-skilling programs.

Company executives cannot afford the risk of not respecting or trivializing technologies, perhaps relying on pseudo-experts, who might have built their

knowledge just by a more or less intensive use of the technology. The mere direct attendance of digital technologies, however intense, is not enough, just as having driven thousands of kilometers in a car does not make a motorist an expert in vehicle designer.

Technological skills are specialized, sophisticated, and indeed rare. Contrary to what one might think, given their crucial importance, digital skills are neither widespread nor easily accessible. Indeed, impulses of specialized knowledge are needed that require large-scale, dedicated structures, a "luxury" that could be afforded only by research centers and by companies having ICT products and services as their core business.

Growing technological sophistication exacerbates the phenomenon. Cyber-security is a good example: how many companies could afford, on their payroll, the critical mass of knowledge and expertise needed to make them autonomous in dealing with all kinds of cyber-attacks? The battle to maintain all the required specialized technological skills in-house would be lost from the very beginning.

A mature and aware approach to this problem needs a paradigm shift: understand and accept what is now impossible and focus all the energies of the company towards the opportunities made possible by the spread of companies offering specialized services based on digital skills and technologies. Company staff can be limited to just knowing how to bridge the gap between experts and business needs, concentrating company resources on the core issues: understanding business needs, monitoring innovation and assessing the available technologies and opportunities, and creating and maintaining strong and mutually beneficial relationships with the most reliable specialized suppliers, experts, and advisors.

In other words: create a control room and gain the ability to ask the right questions rather than to give the wrong answers.

3.2 Respect Market's Laws

Markets follow laws based on a set of key principles that are not dependent on contingent situations. The idea of a new economy driven by new rules is deeply rooted in many references of the literature accompanying the digital revolution (Peitz and Waldfogel 2012; Schmid 2001; Van Alstyne et al. 2016). Although it is certainly true that we are facing a new business context with some changes, the basics do not change with digital technologies. The idea that most of the rules of the game have changed is highly exaggerated. Risk vs return, scarcity, intangible vs tangible investments, intellectual property protection, and similar concepts, like the force of gravity in physics, are always in place and should be considered even in this brave new world. At the very least, these basic concepts should be used to challenge widespread hype with economic wisdom.

Respecting the laws of markets and economic rationality means, for instance, that a good or service of high value is unlikely to be inexpensive in terms of investment, knowledge, and skills. It means that the value must be protected. The alleged existence of sweet spots where we can make money without risk or investments is

the main cause of the explosion of technological bubbles and illusions of easy profits. If anything, this changes the speed and the magnitude of the phenomena, but even this is not entirely true.

3.3 Value Creation Is the Goal

In business, the final goal is value creation, not innovation per se. Technologies and innovation are powerful weapons to create value or to fulfill enterprise objectives. This simple statement should be kept in mind in a context in which the abundance of new technologies and the speed of change can reduce focus. Each innovation has an impact on value. The overall effect of the result of the destruction of some value is that it is replaced by new value. To win the innovation game, lost value must obviously be smaller than new value. For instance, when Harley Davidson decided to introduce an electric bike, a portion of hard-core fans felt betrayed and abandoned the brand. Obviously, this product innovation should attract several new more environmentally oriented clients and new sales. At the end of the day, what counts is that the new value offsets and surpasses the lost value. In this example, it seems this was not the case (Levin 2020; Singh 2019). The idea that innovations, and more specifically digital innovation, can add value without destroying value at best naïve. Managers and entrepreneurs should be able to see through the digital hype and make a sound evaluation of all the forces that are at play.

3.4 Trust

In such a complex environment, it is impossible to master all the domains of knowledge involved in sound decision-making about digital innovation. This is more and more true when many technologies are intrinsically complex and require a deep understanding of different disciplines and contextual facts. The only way to escape the paralysis by analysis syndrome, or at the opposite end of the spectrum, oversimplification, is a good mix of "modesty" and "trust."

Modesty is required for a tangible and pragmatic attitude based on the fact that even some of the largest corporations do not have the critical mass to master technical topics. For instance, new developments in a critical component of most digital innovation, such as batteries, span different disciplines and even involve geopolitical skills for some of the rare minerals needed in some technologies. No single company in the world can insource all the scientists and experts needed to reach a reasonable knowledge threshold. If this is true for the big names, it is even more compelling for mid-sized or small companies.

The only solution is to "trust" institutions, research centers, and even individuals that have the brain power and mass to give good advice to decision-makers.

3.5 New and Legacy Business Cannot Be Separated

The right compromise between innovation and results cannot be achieved by just separating the traditional and the new, business as usual and new business.

Unfortunately, many companies fall into this temptation when they set up new departments dedicated to "innovative projects," sometimes even in the form of autonomous legal entities.

The staff for these new specialized organizational units is often picked up from other areas of the company, depriving the rest of the organization of the figures most capable of disseminating and enhancing innovation. In the short term, these organizational choices can offer positive image returns to executives, who can show stakeholders tangible signs of attention to innovation, in terms of dedicated staff, assigned budgets, and ongoing projects. In the medium term, however, lacking suitable organizational countermeasures, solutions of this type show all their limitations in full: management takes no responsibility and no longer perceives innovation as its priority, and innovation loses strength and is reduced to isolated projects, perhaps useful in terms of image, but of very modest impact.

This separation between old and new activities is particularly widespread in many countries' public administrations, which is also due to outdated rules on public employment that favor bureaucratization and the preservation of existing norms.

If the organizational structure is not adequate to capture technological innovation, it needs to be changed, not fragmented.

Recently, different organizational schemas have been proposed, like *dual models* (Donna and West 2018). In these models, the innovation team is kept substantially separated from business-as-usual activities and has more a flexible and less bureaucratic operating procedure. However, this is not a convincing solution, and it seldom produces the expected results (Clint 2017; Larry 2016), mainly because the innovation process must become an attitude broadly shared by the workforce and not a set of isolated projects (Karimi and Walter 2015; Warner and Wäger 2019).

Successful digital transformations involve the spread of an innovation-oriented attitude that pervades the entire organization, using languages and approaches adapted to the levels of skills and specialization of each organizational area (Bonnet and Westerman 2021; Warner and Wäger 2019).

In order for the top management to focus on the analysis of macro-trends and the implementation of the business model, the organization should master both technical (fundamental technologies) and operational (technological clusters, applications) expertise. Supported by rigorous preliminary investigations by experts in technologies and related possible applications, the information provided to top management must be concise, well-selected, and focused on the key points of interest to decision-makers, including investments, risks, returns, and opportunities.

3.6 Go Beyond Change Management

As will be more fully argued in the fifth chapter, any digital transformation process requires a profound organizational change, but traditional change management models do not work in digital transformation.

The disconnect between the speed of digital changes and the time needed to involve people requires a radical change in the traditional models of organizational support, for example, by supporting different attitudes towards digital technologies.

Understanding resistance and aiming at true people-engagement makes the difference in digital transformation projects for a number of good reasons. Resistance is activated by the search for comfort zones, a human attitude well known in behavioral science. Comfort zones manifest when people reiterate past behaviors in facing new problems and prefer routine rather than exploration. For example, expecting a new information system to perform the same processes running before its advent equates to searching for the comfort of the past instead of taking the opportunity to innovate, thus resulting in value destruction rather than creation. Research has proved with robust empirical evidence that successful digital transformations require a major business-process redesign, which results in a true change management challenge (Shaughnessy 2018; Davenport and Redman 2020). People engagement also counts, especially when the transformation project is mission critical, and it requires full adoption by having everyone on board. The change management models of the past hypothesized that the adoption wave would come over time, being a powerful medicine to persuade skeptics about the change initiative. Being tolerant can pay off and avoid unnecessary conflict management situations that only spoil the organizational climate. But on the contrary, digital transformation projects simply can't pay the price of an extended period of waiting time: this often results in on/off innovations that impose a convinced onboarding on the entire target population. If this doesn't happen, companies face the serous risk of having crowds of "fake adopters," people that are apparently engaged, but often remain hesitant, skeptical, and spread a negative climate about the change initiative. In digital transformations the bar is higher, and new change management approaches are indispensable to avoid these traps.

3.7 Adopt a Systemic Vision

A systemic and thoughtful vision on both the technical and economic fronts is always desirable, as long as it does not turn out to be an excuse for not carefully considering the whole range of opportunities that technology continues to offer to companies.

The persuasive impact of a successful digital transformation able to leverage both the technical specifics and make quick and satisfactory economic returns is incommensurable: all stakeholders will smile at such success. Being at the forefront of new digital technology adoption but lacking economic success is not the same as combining the latest and most admired digital solutions with evident economic

impact. The two dimensions go hand in hand and reinforce each other: understanding feedback loops can make the difference, and there is a strong reason to support this argument. Digital transformations are much more than just change projects: as previously argued, they aim to introduce profound innovations that dictate a new business season for the adopting organization. In other words, successful digital transformations generate a new context, not limited to the adoption of digital technologies. The new context will breed more value and will thus profoundly transform the way business was done. As a consequence, a limited view of only the technical side could endanger the value generation assumed in the planning phases (Tabrizi et al. 2019). On the contrary, orchestrating how technologies will be deployed and successfully adopted happens only with a systemic approach.

3.8 Be a Savvy Adopter

Finally, the real challenge is how to develop the right attitude in the adoption of digital innovations, balancing the need for speed with a well-considered innovation process, which is so important when so much value is at stake, sometimes the very survival of a company. This balance is the key characteristic of savvy adoption, in which all intellectual resources are at play to consider all factors, away from hype and status quo conservations at the same time. Like every other savvy behavior, there is no precise way to define it, but this does not mean that it cannot be engineered and planned following some of the principles listed earlier. The first wave of the so-called digital revolution has shown that only companies that have embraced savvy adoption vs the "me too" approach have increased opportunities to foster consistent value creation.

4 The Path Ahead: The Post-digital Mindset

The "manifesto" described before was the logical and managerial reference for the foundation of the DEVO (Digital Enterprise Value and Organization) Lab at SDA Bocconi in 2016 (Castelli and Meregalli 2016). Since then the research center has gathered more than 30 companies from the supply and demand side of the ICT sector around its mission and developed a set of tools to help entrepreneurs and managers to cope with digital technologies. Over the last 3 years, the DEVO Lab has embraced the philosophy of the "post-digital" movement (see chapter "Enabling the Post-Digital Enterprise"), based on the assumption that the time has come for a more mature and less hype-driven adoption of digital technologies. According to one of the post-digital evangelists (David 2016), we must spend less time marveling at digital innovations and more on business impact. We need to realize that the economic system has already undergone exponential and "disruptive" transformations in the past, such as the diffusion of electricity, the introduction of the combustion engine, radio transmissions, and last but not least, the computer revolution driven by the diffusion of computers in the business world in the 1970s. It

is therefore fair to ask whether the repeated use of the term "disruptive," combined with digital technologies, is appropriate or only due to a context where absolute superlatives have become the baseline. The knowledge and experience gained tell us that we are and we will always be exposed to innovation, change, and complexity. That is why digital transformation is and will always be "Disruptive as Usual."

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Rediscovering the Fundamentals of Value Creation

Gianluca Salviotti

Abstract

While in the last decade Digital Transformation has been claimed as the mandatory path to take to generate business value, the post-digital perspective suggests that Executives can rely on other relevant options for the digital evolution of their organizations. Starting from a customer-driven perspective, this chapter frames the four traditional processes linked to the fundamentals of value creation: digitalization, digital transformation, digital disruption, and digital innovation. Moreover, the discussion highlights a more contemporary approach for incumbent companies aiming at leveraging on digital to continuously generate value: the minimum viable transformation. Eventually, the chapter highlights the main differences and connections between the analyzed approaches, in an effort to provide Executives with a toolkit to craft a solid value-based digital transition path for their organizations.

1 Introduction: Digital Is Not the Starting Point for Value Creation

Standing on the stage without any prepackaged speech in mind, he took few seconds to reflect. One of the attendees, upset about the company having recently killed OpenDoc, just blamed him in front of hundreds of developers seated in the room. He finally laughed off the insult, and went on to explain that he had no doubt that the framework contained some great technology, that it allowed for things no other technology could accomplish. However, that alone was not enough. Then he stated:

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> One of the things I've always found is that you've got to start with the customer experience and work backwards to the technology. You can't start with the technology and try to figure out where you're going to try to sell it. And I've made this mistake probably more than anybody else in this room. And I got the scar tissue to prove it.

He did not leave room for some timid clapping that was rising, because he was not just addressing a provocative discussion; he was actually sharing the lines of the company's success for the next coming years:

> And as we have tried to come up with a strategy and a vision for Apple, it started with "What incredible benefits can we give to the customer? Where can we take the customer?" Not starting with "Let's sit down with the engineers and figure out what awesome technology we have and then how are we going to market that?"
>
> And I think that's the right path to take.

It was 1997. Steve Jobs, having just returned to Apple, was holding this unforgettable fireside chat at the World Wide Developers Conference (WWDC).[1]

It was unforgettable not just because Jobs was at his improvisational best. Not just because he was able to summarize in few words the simple essence that is embedded into the DNA of the third-largest corporation by profit generation[2] and the third-most valuable brand in the world.[3] Steve Jobs' words still represent a manifesto for the proper development, application, and marketing of new technologies: without a clear purpose and solid guidance, even the best technologies and the most skilled technology teams are pointless: *the total is less than the sum of the parts*. *Good engineers—lousy management*.

The link to the customer is a consolidated pillar of value creation, both in theory and in practice (Smith and Colgate 2007). The value of a market offering is ultimately determined by the customer and is conceptualized as a customer's willingness to pay or the benefit the consumer experiences (Chesbrough et al. 2018).

However, 22 years after Mr. Jobs' talk at WWDC, Thomas Davenport and Andrew Spanyi (2019) had to call back the principle, shouting loudly to the business community "Digital transformation should start with customers."

Why, after more than 20 years, do we still have to affirm and reaffirm this mantra? Why do we have to go back to this principle of value creation in wave after wave of transformative business technologies?

As perfectly highlighted in previous research by Davenport and Westerman (2018), for companies, the risk of committing too much to digital technologies and capabilities—without effectively meeting market needs and financial performance—is today higher than ever, for several linked reasons:

[1] The full video and transcripts are available online from several sources. The author refers here to https://allaboutstevejobs.com/videos/keynotes/wwdc_1997_closing_chat minutes from 52:08 to 53:12.

[2] Fortune, 2020, *Global 500 Ranking*.

[3] Forbes, 2020, *The world's most valuable brands*.

- First, when things go wrong in their existing businesses, many executives start to see digital and technology innovations as the sure salvation for their companies, resulting in millions spent to develop digital products and business models only to end up with performance challenges and shareholders' complaints.
- Second, the urge to explore new fields, combined with the perfect storm of transformative, high-impact technologies available today (Chapter "A Tool for the Boardroom: The Devo Lab Hit Radar"), is making executives *lose their rational decision-making approaches*.
- Third, even in growing business cycles, executive decisions around digital technologies and digital business models are *inevitably influenced by hype*.

Hype is driven by the so-called *management fashion setters* that contribute to *disseminating management fashions*, i.e., *transitory collective beliefs that certain management techniques are at the forefront of management progress* (Abrahamson 1996). Not surprisingly, the implementation of disruptive technologies, as well as any kind of digitally enabled business transformation, may be seen as perfect examples of management fashion (Reis et al. 2018). Digital hype can be defined as a *transitory collective belief that a digital technology is new, efficient, and at the forefront of practice* (Wang 2010).

IT and digital fashion setters, such as tech vendors, consulting firms, system integrators, management gurus, mass-media business publications, and—why not—business schools, create hype around selected innovations and promote them as "must-deploy or fail" opportunities in an effort to influence the adoption of the innovation. They also sense the emergent collective preferences of managers for new technologies and practices—such as agile management (Cram and Newell 2016)—to develop rhetoric that describes these technologies and practices as at the forefront of management progress and to disseminate such rhetoric among managers and organizational stakeholders before other fashion setters.

However, hype is not the only factor that pushes executives to start their digital journeys from technologies and not from a clear purpose. Chen et al. (2015) identified other three psychological factors that fuel the intention to adopt a new technology solution:

- The *Fear of Missing Out* (*FOMO*), i.e., the fear of missing a significant market opportunity or profitable investment or innovations that competitors are seeking.[4]
- The *Desire for Innovation*, i.e., to the goal to fend off competition or create new markets, new products, new services, and new capabilities.

[4]The term is borrowed from psychology. FOMO is defined as "a pervasive apprehension that others might be having rewarding experiences from which one is absent" (Przybylski et al. 2013). This social disease is characterized by "a desire to stay continually connected with what others are doing." This new factor is related to a combination of environmental factors and psychological factors, e.g., social contagion theory. Social contagion theory posits that people engage in a process of social learning by examining the actions of peers (DiMaggio and Powell 1983).

- The *Fear of the Uber Effect* (also *Fear of Uberization*), i.e., the fear of being disrupted because of the rise of new business models, like what happened to taxi services after Uber entered the mobility market with a new, on-demand, crowdsourced ride-sharing service (Davis 2016).

The combined effect of the four factors leads to risky digital strategies, questionable pilot projects, and forced use cases. In a summer conversation with the author, a Chief Digital Officer (CDO) of a global insurance company asked for some support because he had to "pilot" blockchain by the end of the year. Why such urgency? Of course, because all the competitors were talking about blockchain. The real problem was that, since the pilot was already linked to the yearly plan, the CDO and his team were struggling to find a candidate process for a blockchain test. He asked the author to hold a design thinking session "to find a problem we can solve with blockchain." The author declined and the CDO switched the subject of the pilot to machine learning, because competitors were also "moving" in this field. One single empirical case makes neither science nor theory. However, blockchain is a perfect example of a technology for which massive experimentation in the last few years has been driven more by irrational choices than by solid market purposes (Koens and Poll 2018).

Another interesting example concerns the technology of drones (Chapter "The Hit Radar in Action"). In 2013, Jeff Bezos announced to the world that, within a few years, a new service called Amazon Prime Air would deliver certain types of products to Amazon's customers in 30 minutes using drones. Meanwhile, drones were moving out of the native perimeter of the military industry, becoming more and more available for consumer applications. Amazon's announcement, coupled with the increasing interest from media and consumers, created the perfect condition for the propagation of a managerial fashion. The combination of *FOMO* and the *desire for innovation* has prompted the largest tech companies, such as Facebook and Google, to begin their own drone delivery tests. Retailers like Walmart, Domino's Pizza, and McDonalds have started drone delivery pilot projects, either alone or with tech partners. The *fear of Uberization* (Uber itself entered the market) has forced large logistics operators such as Fedex, DHL, and UPS to invest in building their own fleet of drones. Everything has two spectators: on the one hand, customers, intrigued by the idea but without any actual urgency or real need to receive a purchase from a drone, and on the other hand, regulators. While customers are still scanning the sky to check if a drone will drop their packages from above, national regulators have begun to intervene, with more or less stringent rules, depending on the context. Today, regulation is one of the key constraints to drone delivery services. Amazon is still conducting pilot projects, and Amazon Prime Air continues to be a "future service," as the company itself refers to it. All the other players in the field are still lagging behind.

Blockchain and drones are just raindrops within the perfect storm of digital technologies that are available today for executives and the companies they run. However, to take advantage of this perfect storm, executives need to develop a cognition regarding what these new technologies can do, as well as understand their

contribution to value creation. Since the curve of technology innovation is continuously evolving, this chapter aims to address the second point, providing executives with a compass to rediscover the fundamentals of value creation in a post-digital world. While leveraging a glossary of digital-related concepts, the next section (2) will introduce and frame the main approaches available for executives to design a digital evolution path for their organizations. The framework is a useful conceptual tool to understand how digitalization, digital transformation, digital disruption, and digital innovation can connect to digital capabilities (Sect. 3) and to the foundations of value creation, towards a post-digital perspective on value realization (Sect. 4). The last paragraph (Sect. 5) will summarize our perspective, introducing a conceptual tool to reflect on digital and value creation.

2 Framing the Approaches to Digital

In order to consider possible contributions to value creation, it is critical for business executives to gain a practical and clear understanding of how the main concepts and approaches related to digital interact. To frame the concepts and build a solid glossary, we take a step back and reflect on some basic definitions taken from the academic literature. The adoption of Information and other digital technologies by organizations is a consolidated topic in management and business studies (Simon 1976; Galbraith and Galbraith 1977). The first wave of IT, during the 1960s and 1970s, automated individual activities in the value chain, from order processing and bill paying to computer-aided design and manufacturing resource planning (Porter and Millar 1985). The rise of personal computing and the Internet enabled distributed computing power coupled with low-cost and ubiquitous connectivity, unleashing the second wave of IT-driven transformation, in the 1980s, 1990s, and 2000s (Porter 2001). Of course, each wave of IT adoption has been sustained by a dedicated stream of academic production. However, to build a contemporary glossary, we refer here to the most recent body of knowledge, focused on supporting the business community to understand the current *third wave* of the digital storm.

Ross (2017) clearly distinguished *digitization*, as an operational necessity, from *becoming digital*, as a customer-centric value proposition. While doing this, she directed attention to the transformational role of digital technologies, i.e., *digital transformation*, confirming Laudon and Laudon's (2005) perspective on the term as the "journey" firms have to embark on in order to become "Digital Firms": i.e., organizations whose significant business relationships with customers, suppliers, and employees are digitally enabled and mediated. Between *digitization* and *digital transformation*, several academic authors (Brennen and Kreiss 2016; Schumacher et al. 2016) and publishing sources (Bloomberg 2018) started to recall the basic and effective term *digitalization*, describing how IT or digital technologies can be used to alter existing business processes. Traditionally, digitalization is not only focused on cost savings, but also includes process improvements that may enhance customer experiences. More recently, Digitization, Digitalization, and Digital Transformation have been viewed as three main phases of a wider (possible) transformation journey

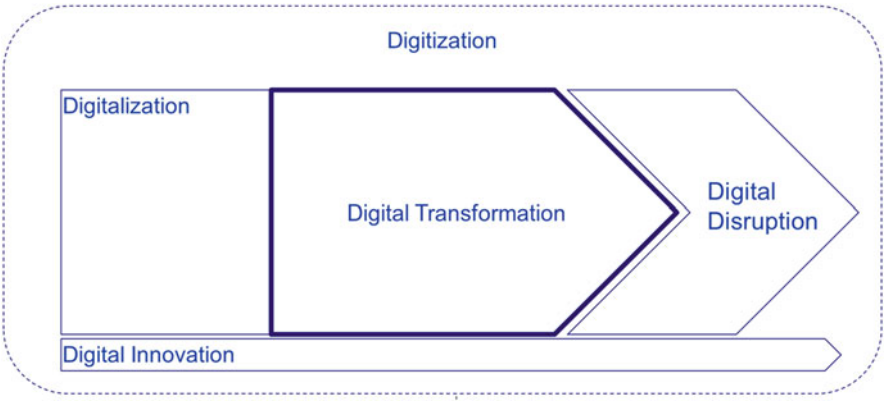

Fig. 1 The relationship among digitization, digitalization, digital transformation, digital disruption, and digital innovation

(Verhoef et al. 2021). In the meantime, the business community also started to highlight the concept of *digital innovation* (Gobble 2018), i.e., *the creation and putting into action of novel digitally enabled products and services* (Hinings et al. 2018). The process of digital innovation can end up with just a new (or improved) product, service, or process, but it can also contribute to transforming companies and completely reshaping industry competition. Smart connected products, for example, have the power to shift the basis of competition from the functionality of a discrete product to the performance of the broader product system, in which the firm is just one of the actors (Porter and Heppelmann 2014, 2015). This was, for example, the idea behind GE's big bet on data and analytics through Predix (Winnig 2016): the company started putting sensors on gas turbines, jet engines, and other machines; connecting them to the cloud; and analyzing the resulting flow of data. The goal was to identify ways to build a new interoperable industrial platform, the so-called Industrial Internet of Things (IIoT), i.e., the convergence of industrial machines, data, and the Internet.

The rise of native platform-based companies that heavily rely on digital innovation of services (e.g., Uber and Airbnb) has finally introduced the key concept of *Digital Disruption*, i.e., *the rapidly unfolding processes through which digital innovation comes to fundamentally alter historically sustainable logics for value creation and capture by unbundling and recombining linkages among resources or generating new ones* (Skog et al. 2018).

Far from being just theoretical artifacts, Digitization, Digitalization, Digital Transformation, Digital Innovation, and Digital Disruption are the key digital-related processes that can be framed to build a digital value chain (Fig. 1).

Digitization is the material process of converting analog information in any form (text, photographs, voice, etc.) to digital form with suitable electronic devices (such as scanners or specialized computer chips) so that the information can be processed, stored, and transmitted through digital circuits, equipment, and networks. According

to this definition, digitization doesn't create value *per se*, but it can be seen as a fundamental precondition enabling any other form of value creation that leverages digital technologies. From this perspective, digitization is more of a surrounding technology-based capability that can be further exploited in a structured and organized context through the process of *digitalization*.

Digitalization is the process of adopting or increasing the use of digital technologies by an organization. According to this perspective, digitalization represents a finalized portion of the broader digitization capability. The focus here is on the adoption of digital technologies, which could refer to:

- A country (e.g., the digitalization of China).
- An industry (e.g., the digitalization of Financial Services).
- An enterprise (e.g., the digitalization of Toyota).
- A single business division or function (e.g., the digitalization of Sales).

The digitization of the consumer world is one of the drivers that forces the digitalization of enterprises and business functions (Harris et al. 2012). Retailers, for example, strive to adopt consumer technologies and to provide new products and services that exploit the capabilities offered by mobile and ever-connected digital devices (Hagberg et al. 2016). Yet, digitalization extends beyond enhancing customer experiences, as it also affects operations, employee experiences, and business models (Westerman et al. 2014; Bonnet and Westerman 2021).

Keeping here the perspective of enterprises, the link with business models leads to a particular form of digitalization: digital transformation. This is the result of the purposeful integration of digital technology into all areas of a business, resulting in fundamental changes to how businesses operate and how they deliver value to customers (The Enterprisers 2016). The *desired result* is what makes clear the difference between digitalization and digital transformation: digital transformation is a digitalization process with a transformative purpose, which goes far beyond just integrating digital technology into business processes. The focus is instead on changing the nature of the organization: business activities, processes, competencies, and models change to fully leverage the opportunities of digital technologies (Hess et al. 2016). Digital transformation involves the revision of strategic, operational, and organizational models that are reshaped around the capabilities enabled by digital technologies.

When the impact of digital on value creation is so deep and radical that it ends up in a revised, if not completely reshaped, value proposition of an entire industry, we refer to *digital disruption*. Digital disruption is distinct from digital transformation for at least for two reasons. First, as the name indicates, digital disruption is the manifestation of a specific innovation process rather than aggregated effects (Skog et al. 2018). As such, digital disruption processes have identifiable agents in terms of both initiators and targets—for example, N26, a digital-native fully mobile startup bank vs traditional banks—and each digital innovation involved is intended to attack, undermine, or render obsolete other actors' mechanisms for value creation and capture: for example, N26 recently launched mobile-based personalized micro-

insurances. Thus, in a digital disruption process, cause and effects can be traced from the firm to the systemic level, and then back to the firm level (Bughin 2017). Second, by nature, digital disruption unfolds more rapidly than digital transformation (Baiyere and Hukal 2020). According to this theoretical framework, digital disruption is mainly driven by newly established, digital-native companies and may affect incumbent enterprises while providing completely new paradigms that reframe the competitive criteria of entire industries. This is why the digital disruption process is detached from the digitalization and digital transformation processes: disruption is usually initiated by new players that are actually born digital, instead of moving to digital. On the other side, it's also easy to understand that digital disruption relies on the broader digitization process. Facebook is a good example. The social network exploits personal devices and mobile Internet diffusion, providing users the chance to digitize their social networks: anytime a user manages to add a connection, they are actually adding an invisible and intangible relationship to a digitized and formalized list of friends. On top of this individual willingness to digitize relationships, Facebook has born and built an entire business model that leverages users' digitized networks to collect data and sell services to advertisers (Rauniar et al. 2014).

While digital transformation and digital disruption are different processes, usually initiated by different actors, they are also strictly interconnected. Digital disruption can act as a driving force for the digital transformation of incumbents. This is, for example, the case with the Spanish bank group BBVA. The transformation of BBVA has a very important pillar in the search for new business models that can directly influence the current way of understanding financial services. Normally these disruptive models come from *fintech* players that redefine part of the value chain of banking services (Brega 2019), generating a new competition for which BBVA responded with a vision aimed at transforming the whole group. In 2014, to accelerate digital transformation across the bank, BBVA built the Digital Banking Area, which draws on a variety of functional units, including marketing, customer experience, technology, and talent and culture. The mandate of the Digital Banking Area is to catalyze digital transformation across the entire group (BBVA 2019). While some players react to digital disruption by launching digital transformation programs, other players try to spin off their own disruptors. Again, in the banking industry, some banks are reacting to digital disruption by building brand new digital businesses, i.e., acting like disruptors (Bhapkar et al. 2021). Examples include Marcus by Goldman Sachs, YONO by State Bank of India, and Illimity by the Italian bank group Intesa San Paolo.

Digitalization, digital transformation, and digital disruption approaches can be seen as both three different options and three different steps within a broader digital evolution path. They are all supported by digital innovation. Ciriello et al. (2018) define digital innovation as the process of *innovating products, processes, or business models using digital technology platforms as a means or end within and across organizations.* According to this perspective, digitalization, digital transformation, and digital disruption are the combined effects of several digital innovations. Traditionally, innovation has been described as a structured, discrete, linear, and

sequential process with clearly ordered, differentiated, and consecutive phases, from idea generation to diffusion and implementation (Desouza 2011). Such innovation phases are also necessary conditions for digital innovations, but alone they are not sufficient to advance the digital innovation capabilities of an organization and must be complemented with *digital innovation practices* (Ciriello et al. 2018). Proof-of-concepts and proof-of-value prototypes can be used to understand the potential of new technologies and identify use cases for emerging technologies. Design Thinking helps to explore user needs in product development and service design. Pilot studies can be applied to study the economic viability of innovative products, services, and business models.

Within the broader digitization context, each of the described approaches can be exploited to generate business value. In theory, the bigger the bet on disruption, the higher the winnings. In practice, it is almost impossible to generalize and state that companies that launch their digital transformation journeys or initiate a disruptive business model are actually able to create and capture more value than companies that retain their traditional business and inject digital technologies to just improve their current operations and market offers. Executives should also understand the risks connected to the different digital steps and evaluate those risks against the potential gains in the long run. This is particularly true for incumbent firms undergoing digital transformation initiatives, which will be our focus in the following paragraphs.

3 Where Is Digital Enabling Value Creation?

According to Porter (2001), economic value for a company is *nothing more than the gap between price and cost, and it is reliably measured only by sustained profitability.* As has been true for the Internet, generating revenues, reducing costs, or simply doing something useful by deploying the perfect storm of digital technologies available today is not sufficient evidence that value has been created.

Adapting Porter's approach when thinking about economic value, it is useful to draw a distinction between the *uses of digital technologies* and *digital technologies per se*, which can be deployed with many uses. Westerman et al. (2014) described several uses of digital technologies by the so-called digital masters, i.e., companies able to cultivate two capabilities: *digital capability, which enables them to use innovative technologies to improve elements of the business; and leadership capability, which enables them to envision and drive organizational change in systematic and profitable ways.* Together, these two capabilities allow a company to transform digital technology into a business advantage. According to a recent update and extension of the original study (Bonnet and Westerman 2021), digital capability entails five main areas:

- Customer experience.
- Operations.
- Employee experience.

- Digital platform.
- Business models.

Experience design, customer intelligence, and emotional engagement are the three elements of enhanced customer experience. Experience design refers to the use of digital technologies to reengineer customer experiences and integrate front-office technologies and processes with back-office operational infrastructure to deliver end-to-end integrated services. Customer intelligence implies the use of digital technologies to integrate customer data, understand customer behaviors, orchestrate highly personalized interactions, and deliver proactive customer services. Emotional engagement exploits digital technology to enable customer participation across a company's value chain: in product development (e.g., Starbucks' MyStarbucksidea.com), content creation, and services.

Core process automation, connected and dynamic operations, and data-driven decision-making are good examples of digital technologies and practices applied to operations. Core process automation finds a perfect enabler in the so-called *Robotic Process Automation* (RPA). Gartner defines RPA as a productivity tool that allows a user to configure one or more scripts (which some vendors refer to as "bots") to activate specific keystrokes in an automated fashion.[5] The bots can be used to mimic or emulate selected tasks (transaction steps) within an overall business or IT process: these may include manipulating data, passing data to and from different applications, triggering responses, or executing transactions. The main purpose of RPA is to obtain productivity gains at the process level, and it can be applied to many repetitive tasks, for example, in accounting, auditing, and HR management (Rozario and Vasarhelyi 2018; Nawaz 2019). Connected and dynamic operations refer to the use of sensors, cloud, IoT, and machine learning technologies to focus on improving the manufacturing process with real-usage data, as well as customer service via predictive maintenance capabilities. Data-driven decision-making in operations allows companies to shift from backward-looking reports to real-time data, with relevant applications to supply chain resilience (Schrage 2020). One of the biggest global logistics players, for example, is leveraging this element to enable the vision "from ocean to globe," with the ambition to govern the supply chains of its customers from shipping containers to inland services, based on a multisided, orchestrated data platform. All nodes and supply chain links (3PLs and 4PLs) will connect to the platform, enabling end-to-end data-driven insights and full visibility of alternative scenarios.

The employee experience is emerging as a key area of digitalization. Employee expectations are changing significantly due to increased digitalization and remote work in the last couple of years. The workforce could be augmented digitally (e.g., providing AI-based solutions to support tasks and decision-making), physically (the number of companies making industrial exoskeletons has been increasing since 2015), and phygitally (e.g., mixed reality applications with AR glasses are quite

[5] www.gartner.com/en/information-technology/glossary/robotic-process-automation-rpa

diffused for remote maintenance). Moreover, AI-based applications such as chatbots and virtual assistants are now popular in recruitment, career development, employee engagement, training, and multiskilling (Zel and Kongar 2020), enabling trends such as future-readying and flexforcing.

New digital technologies and paradigms are also transforming the legacy IT platforms of companies, with impact on three interrelated but distinct elements: the core "backbone" platform, the externally facing platform, and the data platform. Cloud computing, APIs, micro-services, and agile developments are just few examples of digital technologies and practices that can be exploited to create a strong foundation for a scalable, reliable, and secure digital platform. Going back to the BBVA example, the bank doubled its investment in building technology capabilities from €1.2 billion in 2006 to €2.4 billion in 2013 (Buvat and Khadikar 2016). The Spanish bank released the platform after spending about €850 million annually between 2011 and 2013. Its goals were to develop a platform that is "real-time, client-centric, modular and scalable" and to ensure that it can support future customer transaction volumes and data, facilitate open innovation, and strengthen cybersecurity. The platform is progressively meeting all these goals. The bank processed 542 million transactions a day in 2018, compared to 90 million transactions a day in 2006 (BBVA 2018). Building upon this digital platform, BBVA is currently able to attract more digital customers in a single day than it did in a full quarter in 2015 (BBVA 2021).

When it comes to business models, digital transformation and disruption are valid options, but they are not for all. According to our digital value chain, companies may find ways to digitally enhance their existing business models without a transformative or disruptive purpose. As reported by (Bonnet and Westerman 2021), nearly 80% of traditional retailers in the UK are now meshing digital and physical channels through *click-and-collect* services, but they remain retailers, still generating value by distributing products. On the other hand, augmented product features (i.e., wrapping traditional products with sensors, networks, and analytics) are enabling information-based service extensions: as-a-service, subscription-based offerings are appearing in every industry and are particularly compelling for large, expensive items such as power turbines and aircraft engines. Eventually, digital resources can be exploited to build multisided platforms that have already disrupted a range of industries and are pushing many incumbent firms to rethink their strategic positioning within newly established or revised ecosystems. In the executive education market, players like GetSmarter are connecting business schools, industry experts (success managers), and professional trainers (tutors) to working professionals by delivering full-online premium short courses with a data-driven focus.[6] MIT Sloan School of Management, Oxford Saïd Business School, Harvard Business School, and many others have joined the platform to target millions of managers and executives rather than trying to build their own proprietary online ecosystems.

[6] https://www.getsmarter.com/about-us

BUSINESS MODEL		
Digital enhancements		
Information-based service extensions		
Multisided platform businesses		
CUSTOMER EXPERIENCE	**OPERATIONS**	**EMPLOYEE EXPERIENCE**
Experience design	Core process automation	Augmentation
Customer intelligence	Connected and dynamic operations	Future-readying
Emotional engagement	Data-driven decision-making	Flexforcing
DIGITAL PLATFORM		
Core		
Externally facing		
Data		

Fig. 2 The elements of digital capability (Bonnet and Westerman 2021)

The ways a company configures and combines the elements in Fig. 2 determine specific value generation trajectories, from pure digitalization to digital transformation and disruption. Moving bottom-up, investing in one or more elements of the digital platform can be a starting point to build solid foundations to support the digitalization of some of the elements of customer experiences, operations, and employee experiences. Coupled with a unique transformative purpose and pervasiveness of initiatives, this digitalization intent can then lead to digital transformation, supported by digital innovation practices aimed at organizational learning. Moving top-down, on the other hand, the strategic intent to focus on business model transformation and enhancement (digital transformation) calls for a revision of customer experiences, operations, and employee experiences elements, and—of course—it requires a solid digital platform to rely on. A third possible approach consists of cherry-picking elements of the digital platform, customer experience, operations, and employee experience, without any specific transformative purpose, just maintaining a digitalization strategy. In the last few years, both cherry-picking digitalization and the top-down approach to digital transformation have prevailed, with mixed fortunes.

4 How Is Digital Enabling Value Creation? A Return to Fundamentals

One of the main problems executives faced in the first wave of digital transformations relates to the misunderstanding of the economics of digital (Bughin et al. 2018). Returning to Porter's point, investing in digital technologies is not enough to generate and capture economic value. Digital is not just a thing that managers can buy and plug into the organization. Digital technologies are inanimate resources purchased as inputs to the company's processes. As such, they are incapable of transforming themselves into anything other than what they are. They

need to be integrated, combined, tested, and applied to one or more of the elements in Fig. 2 before they can contribute to the production of new *use values*. New use value is created by the actions of organizational members, who transform the value-in-use of the technologies. This, however, does not mean that organizational members, when producing new use values, necessarily produce products that can realize added *exchange value* (i.e., the realization of exchange value superior to the costs of the resource inputs). According to Bowman and Ambrosini (2000) *how much exchange value has been added can only be determined when the newly created use value is sold. At this later point in time, this use value will be compared by potential customers with competing products, and only where a customer perceives superior consumer surplus to have accrued will the customer buy that particular product. So the amount of exchange value the organization can capture is known only at the time of sale; that is, the organization will not know what the newly created use value is worth until it is exchanged. So we cannot assert that, in the process of new use value creation, "value" has been added. Different use value has been created which may or may not yield added exchange value.*

Markets, and specifically customers, are the final judges of value creation. This was something clear to Steve Jobs, whose pragmatic speech in 1997 confirmed that *there is nothing more practical than a good theory* (Lewin 1952).

This theory of value creation also explains one of the lessons learned from digital transformation failures: always calibrate the level of digital investments and efforts to the readiness of the industry, especially customers (Davenport and Westerman 2018). A previously mentioned example helps here. GE launched Predix in the Oil & Gas industry, promising customers in the field—global Oil & Gas companies—to increase their productivity and eliminate their downtimes by using data collected via sensors from their production processes, integrated with other players' data into the cloud, and analyzed with predictive analytics algorithms. GE invested $1 billion to build this value proposition, with the unexpected result that they found sales people unable to convince Oil & Gas customers to share their data. GE started to sell using pilots, further lowering Predix's perceived value in this rich—but conservative—market. Customers considered their data more valuable than Predix's predictions and initiated their own analytics platforms (Murray 2019). The low value recognized by Oil & Gas customers did not validate GE's huge commitment and resource investments (Winnig 2016).

In other words, customers assess the overall value of a product using perceptions of what is given and what is received (Zeithaml 1988). This is why (Porter and Millar 2011) argue that information technology creates value by supporting differentiation strategies along the value chain. Of course, a company can use digital technologies to pursue operational efficiency within cost strategies, but this is not considered a source of competitive advantage in the long term (Porter 2001). Digitalization is mainly linked to "traditional" differentiation and cost strategies.

Digital transformation and digital disruption are linked to different patterns. Brynjolfsson and Hitt (2000) find that companies using information technology to change the way they conduct business often say that their investment in information technology complements changes in other aspects of the organization and direct

attention to the risk of value destruction: *These complementarities have a number of implications for understanding the value of computer investment. To be successful, firms typically need to adopt computers as part of a "system" or "cluster" of mutually reinforcing organizational changes. Changing incrementally, either by making computer investments without organizational change, or only partially implementing some organizational changes, can create significant productivity losses as any benefits of computerization are more than outweighed by negative interactions with existing organizational practices*. Amit and Zott (2001) added that value creation opportunities in virtual (digital) markets may result from new combinations of information, physical products, and services; innovative configurations of transactions; or the reconfiguration and integration of resources, capabilities, roles, and relationships among suppliers, partners, and customers. Thus, they focus on the *business model* as the unit of interest to understand how value can be created in the digital world (Zott and Amit 2017). While doing this, they also broaden the concept of value, assuming a stakeholder perspective. A smartly designed new business model (i.e., business model innovation) is described as *a system of interconnected and interdependent activities that determines the way the company "does business" with its stakeholders. In other words, a business model is a bundle of specific activities—an activity system—conducted to satisfy the perceived needs of the market.*

The three design elements that characterize a company's activity system are content (what), structure (how), and governance (who). Changing one or more of these elements means changing the entire model, and if the new (digitally enabled) business model is "new to the world" and not just "new to the company" it can be considered real business model innovation. Content, structure, and governance can be highly interdependent; they need to be in line with value creation and capture the goals of the company ("why," i.e., the company's vision or purpose). There are four major value drivers of business models: novelty (the degree of innovation in content, structure, and governance); lock-in (elements that create switching costs or incentives to stay); complementarities (positive effects among activities, structure, and governance); and efficiency (cost savings). Each of these value drivers enhances the total value-creation potential of a business model but when combined—and combined to digital—they can be even more powerful and lead to the destruction of economic rents (i.e., digital disruption).

Business model innovation is not just for digital disruptors. A study from McKinsey shows that incumbent firms pursuing digital transformations through business model innovation are seeing larger gains in revenues and earnings than traditional incumbents that have yet to embrace digitization (Bughin et al. 2017). These digital immigrants are investing at scale in technology and digital talent, and they make more digital-related acquisitions and divestitures than traditional incumbents. They accelerate changes in their own businesses, and they are using more advanced, innovative technologies. In other words, they are building *dynamic capabilities* for digital transformation (Warner and Wäger 2019):

- Digital sensing capabilities, such as digital scouting, digital scenario planning, and digital mindset crafting.
- Digital seizing capabilities, such as rapid prototyping and balancing digital portfolios.
- Digital transforming capabilities, such as navigating innovation ecosystems, redesigning internal structures, and improving digital maturity.

Dynamic capabilities may not be sufficient for firms' performance improvement, but their contribution to performance is significant (Teece 2018). Digital innovation practices play a key role in shaping the dynamic capabilities for digital transformation, confirming that the two approaches (i.e. innovation and transformation) can be tightly coupled in the path toward value creation. In this perspective, digital transformation is executed as an *ongoing process* (instead of a project or program) *of strategic renewal that uses advances in digital technologies to build capabilities that refresh or replace an organization's business model, collaborative approach, and culture*.

This post-digital approach to digital transformation—also referred as *minimum viable transformation* (Bruun-Jensen and Hagel 2015)—can deliver value according to each of the following perspectives:

- In the short term, via the continuous digitalization of operations, with a cost-saving orientation.
- In the short-to-medium term, pursuing a differentiation strategy via the digital platform, and customer and employee experiences.
- In the medium term, via the development of sensing, seizing, and transforming dynamic capabilities.
- In the medium-to-long term, via business model innovation.

Table 1 offers a comprehensive overview of the main approaches executives can exploit to lead the digital evolution of their organizations: digitalization, digital transformation, digital disruption, digital innovation, and minimum viable transformation. Each approach applies to specific companies (initiators) and digital capabilities, leading to a specific pattern of value creation. Pure digitalization fits with incumbent firms aimed at pursuing cost and differentiation strategies in their industries, while cherry-picking within customer experience, operations, employee experience, and creating a fit-for-purpose digital platform. Digital transformation is a top-down process aimed at transforming the business model, with a specific set of actions (digital strategy) that touch all the elements of digital capability.

Digital native companies initiate digital disruption. Their new business models change the structure of economic rents within the industry, by creating—on average—more value for customers than for firms (Bughin et al. 2018): *this is big and scary news for companies and industries hoping to convert digital forces into economic advantage*. This is why digital disruption usually forces incumbents into digital transformation. The risk, here, is to start the journey with a hype-driven approach (Sect. 1) and without a clear, well-defined purpose of value creation for

Table 1 Digital approaches and value creation

Approach	Initiators	Digital capability	Value creation
Digitalization	Incumbents	Process oriented adoption to: • Customer experience. • Operations. • Employee experience. • Digital platform.	• Differentiation (and cost) strategies.
Digital transformation	Incumbents	Top-down, vision, and strategy-oriented approach to: • Customer experience. • Operations. • Employee experience. • Digital platform. • Business model.	• Business model innovation (new for the company).
Digital disruption	New players	Focus on radically changing: • Customer experience. • Business model (multisided platform).	• Business model innovation (new for the company, new for the world).
Digital innovation	Incumbents New players	Experimentation and prototyping around: • Customer experience. • Operations. • Employee experience. • Digital platform. • Business model.	• Dynamic capabilities.
Minimum viable (digital) transformation	Incumbents	Continuous learning and scale focus on: • Customer experience. • Operations. • Employee experience. • Digital platform. • Business model.	• Differentiation (and cost) strategies. • Business model innovation. • Dynamic capabilities.

customers. The problem for many incumbents is to be able to sense and seize the opportunities related to digital and balance them with the traditional business model in a sustainable way. If not joined with a digital innovation process aimed at creating solid dynamic capabilities, and with strong leadership capability—which enables them to envision and drive organizational change in systematic and profitable ways—digital transformations fail to deliver value through business model innovation (Davenport and Westerman 2018; Westerman 2019). Digital capabilities, leadership capabilities, and digital innovation capabilities play a crucial role in the minimum viable transformation approach, which considers digital transformation an ongoing process aimed at creating value through cost and differentiation strategies, business model innovation, and new dynamic capabilities.

5 Conclusions: Value Creation vs Value Destruction

As we have understood throughout this chapter, starting from Steve Jobs' intuition, a well-crafted customer-aware vision and a well-defined strategy are two mandatory preconditions to create value with digital technologies. These two preconditions differentiate digital transformation from pure digitalization. As perfectly highlighted by (Westerman 2019):

> Because digital transformation is more of a leadership challenge than a technical one, it's essential to focus managerial attention on people's desire to change and the organization's ability to change. You want to convert digital transformation from a project into a capability.

To convert digital transformation into a capability, the author suggests a focus on three major areas: change the vision, change the legacy platform, and change the way the organization collaborates. However, the perfect storm of digital technologies available today does not always translate into value for customers, and as a consequence, for key business stakeholders, including shareholders. The evil combination of Hype, FOMO, Fear of Uberization, and Desire for Innovation often leads executives and managers to focus too much on the tech part of game, missing the reason why they are committing to digital investments. Coupled with a short-to-medium-term perspective, this kind of approach could be extremely dangerous and result in value-destroying initiatives. In other words, being at the forefront of digital innovation in a specific industry, without all the necessary dimensions aligned—vision and strategy, legacy platform, organization and people, operational mechanisms—can generate the paradox of value destruction. On the other hand, a small, well-scoped digital initiative that just aligns the company to the state-of-the-art of the industry in terms of digitalization can lead to significant extra value, if coupled with the proper set of complements (Brynjolfsson and Hitt 2000).

In an attempt to provide business executives with a useful conceptual model to consider value creation and value destruction, SDA Bocconi DEVO Lab created a simple matrix that can effectively summarize the key take-aways from this chapter. The matrix is the result of several interactions with a group of C-level managers operating in 20 large companies in different industries. While providing examples of digital initiatives and use cases of digital technologies in their companies, the managers shared the actual results experienced by their organizations, with the promise that they would remain anonymous. By matching the dimensions of "value creation" and level of digitalization compared to the industry PAR (i.e., the baseline level of digitalization of the competitive environment of a given company), DEVO Lab elaborated the Digital Value Matrix presented in Fig. 3.

Four possible profiles emerge:

- Digital Laggards.
- Smart Procrastinators.
- Digital Self-Harmers.
- Digital Masters.

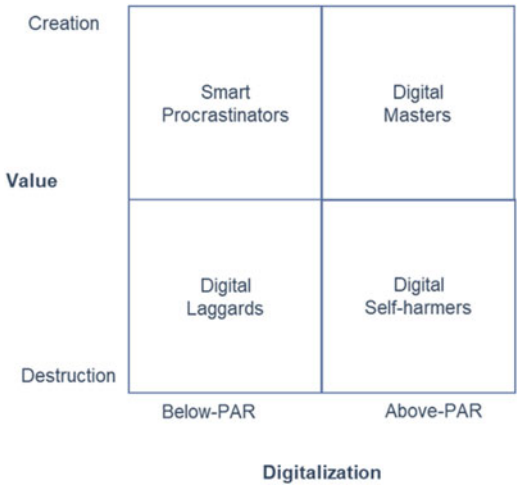

Fig. 3 Digital Value Matrix

Digital Laggards are organizations that are characterized by a lower level of adoption of digital technologies compared to their industry peers and a tendency to launch pure hype-driven digital initiatives. This leads them to destroy value, as they have fallen behind the pace of advancement of their competition arena and they lack strategic assets to compensate for their lack of digital capabilities. Laggards urgently need to define a plan to recover from their digital delay and to begin an IT and organizational restructuring to move along with the rest of the market.

Smart Procrastinators are organizations that are able to generate value in spite of their delay in adopting (one or more) digital technologies, at least compared with their industry benchmark. This is, for example, the case with companies that leverage coherence, authenticity, and heritage to nurture their brand's image. Therefore, they procrastinate over the adoption of digital solutions either because it would dilute the DNA of their offering, or because a solution that is customized enough to suit the exclusivity and peculiarity of the processes and products of the firm remains unavailable. Yet, due to the strength of their assets and values, they are still appreciated and valued by the market, as they have been for decades. However, it is crucial for such procrastinators to stay aware, making sure they cherry-pick specific digital solutions that can enhance their offering and upgrade their capabilities, or they could end up losing their "smart" flavor and fall into laggard land.

Digital Self-Harmers are organizations that, in spite of a greater level of adoption of (one or more) digital solutions compared to their competitors, are unable to capitalize on their potential and end up choking their offerings and processes. This is the exemplary case of firms focused on short-term result generation that do not take the time to properly build awareness, experiment, and fine tune digital solutions based on their core differentiating assets. As a consequence of their excessive alacrity, they end up cannibalizing their own businesses or product lines (e.g.,

through conflicting online and offline strategies, obstructing business alignment, or hindering a seamless omni-channel customer experience) or reducing their internal efficiency (e.g., by imposing unnecessary collaboration tools or by not planning an internally fed and autonomous operative model to manage the technological solutions that have been adopted). Self-harmers need to hit the brakes on their rush and take the time to rationalize a conscious and focused strategy to deploy their digital capabilities with a perspective of long-term value creation.

Eventually, Digital Masters are organizations that match the early and wide adoption of several digital technologies with the creation of incremental value for both the external market (through enhanced offering and improved customer experience) and internal functioning (through increased efficiency and employee satisfaction). This is the case with companies that are able to strike a balance between the hunger for digital and careful planning and adaptation for, as much as possible, where each specific digital solution can fit within their business model.

The Digital Value Matrix can be applied to describe different situations, even starting with the same technology. The case of the already mentioned RPA is exemplary here. In recent research focusing on the digital evolution of Finance departments, we found a large number of companies approaching RPA as a way to streamline badly designed accounting and control processes. After experiencing some interesting productivity and efficiency improvements in the short term, those companies started to invest massively in software bots. However, in the medium term, RPA started to increase the complexity of the IT platform, and most of these companies lost control of many processes, leading to the need to dismantle robotics and start a full end-to-end redesign of their business processes. We can refer to these companies as Digital Self-Harmers. On the other side, we found an interesting subset of Smart Procrastinator companies using RPA just to create automation on top of already redesigned business processes, with a "last-mile" value creation approach. They are adopting less RPA and applying it only where and when it is perceived as an extra value. Moreover, we also found Digital Masters approaching RPA: Digital Masters are strategically exploiting software robotics to gain efficiency in the short term, while redesigning their business processes end-to-end and eventually leaving a "last-mile" space for some point automation. Digital Masters acknowledged that redesigning a business process would take a long time, so they are combining short-term, quick wins with higher returns in the long-term. At the end of their journey, they'll probably dismiss a huge portion of their robotic automation, but eventually the end-to-end redesign will pay the bill for everything.

The Digital Value Matrix, combined with a properly designed digital evolution path around the main approaches described in this chapter, can contribute to addressing one of the main doubts of digital transitions: how can digital help to generate business value?

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Competences and Capabilities for Digital Value Creation

Lorenzo Diaferia

Abstract

This chapter aims to synthetize the vast debate on how to build and maintain the competences that firms need in the digital world. In doing so, we source from two complementary views. First, a bottom-up view of the competences and skills of single individuals. Second, a top-down perspective that focuses on the importance of organizations that can systematically scan the external environment, select priorities, mobilize the right individual competences, and orchestrate them to drive the result home. The role of digital product teams in modern tech companies tries to achieve exactly this goal. Even non-tech businesses, not naturally structured to enable this orchestration and reconfiguration, are taking inspiration from this approach and mentality to foster change.

1 Digital Technologies and the Urgent Debate on Competences and Capabilities

"The rapid pace of digital transformation is changing every aspect of our lives—and is also generating needs for new skills and knowledge in the workplace" (Benini and Nardelli 2020). So wrote the head of the Digital Economy and Skills Unit of the European Commission, opening a blogpost on the digital talent gap in Europe. In the same year, many surveys on the topic found that roughly 70% of companies were experiencing a widening of the digital talent gap compared to previous years. Undoubtedly, the urgency of a reinforced digital job market has turned into a refrain for policy makers, companies, educators, and jobseekers. In this chapter, we try to give some coordinates to reflect on the complex problem of competences for the

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digital world. We do not aim for a magic recipe to build the perfect set of skills that foster digital value creation. The importance of the context (internal and external) in which companies operate, and their history, makes the search for "best-practice" digital competences misleading. We rather attempt to underline a double view of competences that helps to reason about the problem in an organic way.

But first, what makes the debate on skills and digital so urgent?

Let's go through some key facts about the intersection between digital and competences. For a long time, there has been a silver-bullet view of digital technologies, that once a technology is adopted, the problem is solved automatically. However, the previous chapter shows how different approaches exist and how generating value according to these mechanisms is all but an automatic process. Initially, some have even thought that the infusion of new generations into the workforce could push digital value creation. Millennials, born between 1980 and 1996, have been entering the workforce while the business debate around digital transformation has blossomed. Despite high expectations, it soon became apparent that it is one thing to be keen on digital technologies as individuals, and another to effectively transfer this to the workplace and drive change. It would be similar to think that a taxi driver or sales representative who drives hundreds of miles every week could engineer a car and systematically plan its roll out in a production plant. In the DEVO Lab Digital Manifesto, we try to underline how respecting technologies and acknowledging that technical competencies are scarce are key pillars in order to put technologies to work in the post-digital enterprise. It has become clear that digitization, digitalization, and digital transformation require far more than new generations and that a real debate on how to develop, acquire, and bring together a set of variegated competences is due.

Over the last 20 years, technologies have created profound impacts on businesses and individuals. One fact can help to set the stage for a reflection on competences. It has to do with customers. Let's take the smart speakers and virtual assistants example. In a little more than 2 years, from 2018 to 2020, the number of brands with virtual assistant services compatible with Amazon Alexa grew from 1200 to 9500 (Statista 2020). The increasing diffusion of software-based digital products and the adoption of new ways to interact with contents has impacted not only digital businesses, but traditional enterprises as well. Building "customer satisfaction" and "customer centric" digital organizations has become a bit of a cliché in business—in general, who would want to create an organization that keeps customers at the margins and doesn't bother with their satisfaction? But the point is key. Studies found that a ten second wait for a page to load can make 50% of prospective visitors leave and that a website starts losing traffic to its competition when it takes 250 milliseconds longer to load (Borowski 2015). As Jeff Bezos puts it: "If you make customers unhappy in the physical world, they might each tell six friends. If you make customers unhappy on the internet, they can each tell 6,000." Not to be outdone in the race to the best "customer centric" quote of the year, Zappos' CEO Tony Hsieh remarks that, "Customer service shouldn't just be a department; it should be the entire company." The centrality and pursuit of constant improvements in customer experience now guide most tech companies that claim to be "obsessed"

with their customers. Slogans apart, building digital products in a fast-changing external environment and being responsive enough to adapt them to feedback with trial-and-error approaches puts both competences and organizational structures under stress. How can firms cope with this?

Finding the proper recipe is not easy, and of course the right approach will heavily depend on individual cases. However, tackling the issue from two different but complementary perspectives helps to set the stage for the development of company-specific paths.

2 Competences and Capabilities: A Bottom-Up and Top-Down View

Over time, the theme of competences, skills, capabilities and their role in determining job performance and driving competitive advantage have been faced by both the Strategic Management (SM) and Human Resource Management (HRM) literature. While the first tends to operate at the organizational level with a top-down view, the second is much more focused on the individual and adopts a bottom-up perspective. This double view of competences can be a useful source of inspiration in the digital debate. On one hand, there is an urgency to identify, codify, and standardize the skills needed by individuals for the challenges of digital transformation and digital products. On the other hand, there is the idea that digital value generation needs a higher-level orchestration of single competences, something that can be achieved only at the organization level.

2.1 The Bottom-Up View: Individual Competences and Skills

In HRM, competence assumes an individual-oriented view. The concept can be traced back to the American behavioral psychologists Robert White and David C. McClelland. In 1973, McClelland raised the question of whether intelligence and aptitude tests could serve as predictors of job success. He believed that skills needed to be complemented with other personal characteristics to better serve the objective (McClelland 1973). His work was welcomed with great interest by the business and industrial communities. Some years later (1982), Richard Boyatzis introduced the idea of "competency" in his book *The Competent Manager* (Boyatzis 1982). He describes competency as the "underlying characteristic of an individual that is causally (. . .) related to superior performance in a job." Or, as defined in the European e-Competence Framework, "competence is a demonstrated ability to apply knowledge, skills and attitudes to achieving observable results." Definitions vary, but in general, competencies are regarded as comprised of a number of areas that encompass both technical characteristics and personal traits of individuals. For instance, they can be explained by a mix of knowledge, skills, traits, and motives (Tucker and Cofsky 1994), or grouped into technical, managerial, human, and conceptual competencies.

The academic and practice-oriented debate proliferates with perspectives that do not make the adoption of a common language straightforward. Add to this that when "digital" comes into play labels and buzz words are the norm, and you have the perfect grounds for misunderstanding. What is important to us is that this view encourages reasoning about the skills that single practitioners need to have to bring value. In the digital world, this idea has been at the center of numerous attempts to bridge the gap between the advancement of technologies and the competences of citizens and employees. Many frameworks have been developed over the years for the context of digital transformation, in order to build a standard language and define new roles in the digital and IT fields. Often, these frameworks have been created by policy makers, international organizations, or government bodies.

We collected a list of well-known digital competence frameworks for modern IT and digital skills developed in recent years in the European context. We went through various models from the EU. The European Framework for IT Professionalism (2017) (European Commission 2017a), the European e-Competence Framework (2014) (European Commission 2014), and the Digital Capabilities Reference Framework (2019) (European Commission 2019a) all target professionals and companies, while the Digital Competence Framework 2.0 (2017) targets general citizens (European Commission 2017b). We also examined the Skills Framework for the Information Age (2019), which offers a specific "skills view" for digital transformation (SFIA 2019). The list is by no means exhaustive but offers examples of how the topic has been dealt with by institutions and foundations.

What we noticed is that these models often target the single individual and aim to provide a standard language across countries to define professional profiles and their competences. For instance, the European e-Competence Framework provides a categorization of the skills needed in five core areas: plan, build, run, enable, and manage. The framework points to e-competences specific for every phase, like application design, technology trend monitoring, user support, and process improvement. The guidelines for digital transformation of SFIA are instead divided into four categories and 45 skills, organized according to seven responsibility levels. Skills such as user research, information security, user experience analysis, and system design are mapped and described.

In most cases, the objective is to promote the development of professional profiles able to meet the challenges that a business faces in the digital environment. If you decide that, given your exposure to cybersecurity risks, you need to bring on board dedicated know-how, these models try to answer the following questions: What competences should I be looking for? What professionals can provide them? The design and birth of new jobs, created and introduced to support digital initiatives, is a good example of this perspective. The case of Chief Digital Officers and Data Scientists are emblematic. In a 2013 *MIT Sloan Management Review* article, Robert Berkman reflects on the emergence of the Chief Digital Officer, a new entry in the C-suite at the time. CDOs were regarded as those that should "provide oversight and strategy and create a big-picture view of how social and digital technologies can make a difference to the entire organization" (Berkman 2013). In 2013, a LinkedIn search for people with the title "CDO" returned roughly 700 names. The same today

returns more than 6700 professionals currently holding this position. Similarly, data scientists, officially born as a label in 2008, responded to the need for proper "training and curiosity to make discoveries in the world of big data." They are still among the sexiest and best paid jobs of our century. In a 2019 report by LinkedIn, this role was ranked the most valued professional profile of 2019, with a year-over-year growth of 56% (LinkedIn 2019). We don't want to deny the great role and contribution of these professionals to the digital evolution of companies. The demand for both CDOs and data scientists shows how they, and their competences, have helped in many contexts. However, what we ask ourselves is this: Isn't the debate still missing a crucial element?

One of the models we went through tries to underline a slightly different perspective. The European Digital Capabilities and Reference framework touches on an important point. Digital initiatives do not only require the creation of single workers and professionals with the right set of skills but also the ability to reason at a higher systemic level, in terms of capabilities. In the model, we read the following: "this framework is aiming at establishing a connection between capabilities of the organisation and competences of the employees to support organizations in their digital transformation journey" (European Commission 2019b). In other words, in the context of digital value creation, the debate cannot be limited to the skills and competences of single individuals. Digital initiatives and the management of digital products require the introduction of a second complementary perspective that responds to the need for aggregation and orchestration of such competences. Take the example of digital products. When you buy something on Amazon, every single step of your customer journey has someone in charge of rapidly responding to customer feedback by adapting that portion of the product to maximize conversion and increase revenues. This responsiveness is not the output of individual professionals, who are of course necessary, but rather the result of the orchestration of diverse individual competences. In the rest of the chapter, we try to give some cardinal points to reflect on this. How can businesses consider this more organizational-level capability for digital value creation? Here is where the second view, a more top-down view, comes into play.

2.2 The Top-Down View: The Organization's Capabilities

During the 1990s, a new theory became predominant in the Strategic Management debate. The resource-based view (RBV) was seen as a way to respond to an increasingly dynamic environment in which new technological advancements changed the nature of competition. This theory directs managerial attention to the internal resources of companies, with competences seen as one of the ways in which firms ensure competitive advantage. The focus here shifts to the organizational level.

In this context, an interesting concept was coined at the end of the 1990s: the idea of dynamic capabilities. Dynamic capabilities refer to the firm's ability to integrate, build, and reconfigure internal and external competences in order to address rapidly changing environments (Teece et al. 1997). As Teece and his coauthors put it in a

2016 article, "this class of capabilities is underpinned by organizational and managerial competences for both 'reading' and shaping the environment and developing business models that address new threats and opportunities. Dynamic capabilities thus define the firm's capacity to innovate, adapt to change, and create change that is favorable to customers and unfavorable to competitors" (Teece et al. 2016). This term is a fancy expression for a concept with useful managerial implications in digital transformation. It provides an analytical tool to think about creating strategies and organizing resources in highly uncertain environments. To be precise, in this theory resources are not limited to competences. However, we can find inspiration in these principles and refer to capabilities as the ability of companies to mobilize their competences and orchestrate them to dynamically adapt to the changing environment.

This debate couldn't be more compelling today, in an era in which the digital environment is more dynamic than ever. Dynamic capabilities can be organized around three categories (Teece et al. 2016):

1. Sensing capabilities
2. Seizing capabilities
3. Shifting or transforming capabilities

Sensing refers to a systematic study of the external environment in search of technological opportunities and threats. It involves scanning, exploring technological opportunities, probing markets, and listening to customers. It also requires building hypotheses and testing them on the market and interpreting the expressed (an unexpressed) needs of customers. Sensing requires managerial acumen, supported by a proper analytical process. Take the Apple case. When the firm first launched the iPod, the sensing phase involved the capability of scanning the external market and understanding the perception that traditional mp3 players had in the mind of most customers in the mass market. In the following chapters, the High Impact Technology (HIT) Radar will be presented. This managerial tool developed by the DEVO Lab is the output of a structured process that starts with a systematic monitoring of the market, in search of new digital trends that might impact companies. This methodology of scouting, classification, and assessment is an example of an activity that can help the sensing power of a company or team.

Seizing capabilities refers to the mobilization of the proper resources to design new ways to capture value and satisfy customers. This involves securing access to and organization of the proper assets, competences included. Through seizing, firms decide how to address the opportunities through products, processes, or services. In the iPod example, seizing involved the development of the iPod and iTunes themselves, as well as the firm's shift in focus from computers to the larger sector of consumer electronics. Transforming instead refers to an "ability to recombine and to reconfigure assets and organizational structures" to match the organization's internal processes with the opportunities seized in the previous phase. This entails renewing company processes and maintaining their relevance to consumers over time. For

Apple, this applies to the iterations of the iPod (e.g., iPod Nano, iPod Touch) and iTunes versions released over the years (Fig. 1).

These three classes of capabilities, combined with the bottom-up perspective of individual competences, give a good view of the two perspectives that firms need to develop for digital value creation: on the one hand, a workforce with individual skills to support digital projects, and on the other, and most importantly, the organizational capability of mobilizing and orchestrating such competences to catch value. But how do firms actually implement this in practice?

3 How Digital Comes to Life: The Aggregation and Orchestration of Competences

In a well-known article, Davenport and Spanyi recall how, back in 2011, some studies suggested that companies needed to digitally transform operational processes, business models, and the customer experience altogether. Most companies do not have the resources to transform all this, and in most cases, it doesn't even make sense to do so. So, the authors ask, where should firms start? They argue that the best way is to focus on updating and digitally evolving customer experience, relationships, and processes, focusing effort where it is most beneficial and visible to customers (Davenport and Spanyi 2019). Sometimes, this can even entail the creation of a new class of digital products, even for traditional organizations. For example, around 40 million customers interact digitally with the Spanish bank BBVA, which offers a range of digital products and services (the digital opening of bank accounts, an expenses-monitoring system, and customer financial advisory services). To develop, launch, and manage these customer-oriented products, firms need to keep their eyes open constantly. They need to absorb the feedback provided by customers, intercept potential benefits and threats that new technologies pose to their customers, and have the capabilities to mobilize resources, formulate hypotheses, and test them on the market. The similarities with the three capabilities (sense, seize, reconfigure) we just described are apparent. Successful digital offerings are created in that small sweet spot where what technology can offer intersects what customers truly want. "To find it, companies must experiment repeatedly, cocreate with customers, and assemble cross-functional development teams" (Ross et al. 2019). How do firms use a diverse pool of competences to sense, seize, and reconfigure to catch digital opportunities and act in this sweet spot? To understand how all this comes to life, the best thing is to look at how tech companies are tackling this issue.

3.1 The Digital Product Management Approach

A good example of how companies bring together single competences, mobilize them, and develop the dynamic capabilities for digital value creation comes from the most famous tech companies. From Amazon to Zoom, Booking.com to Zalando,

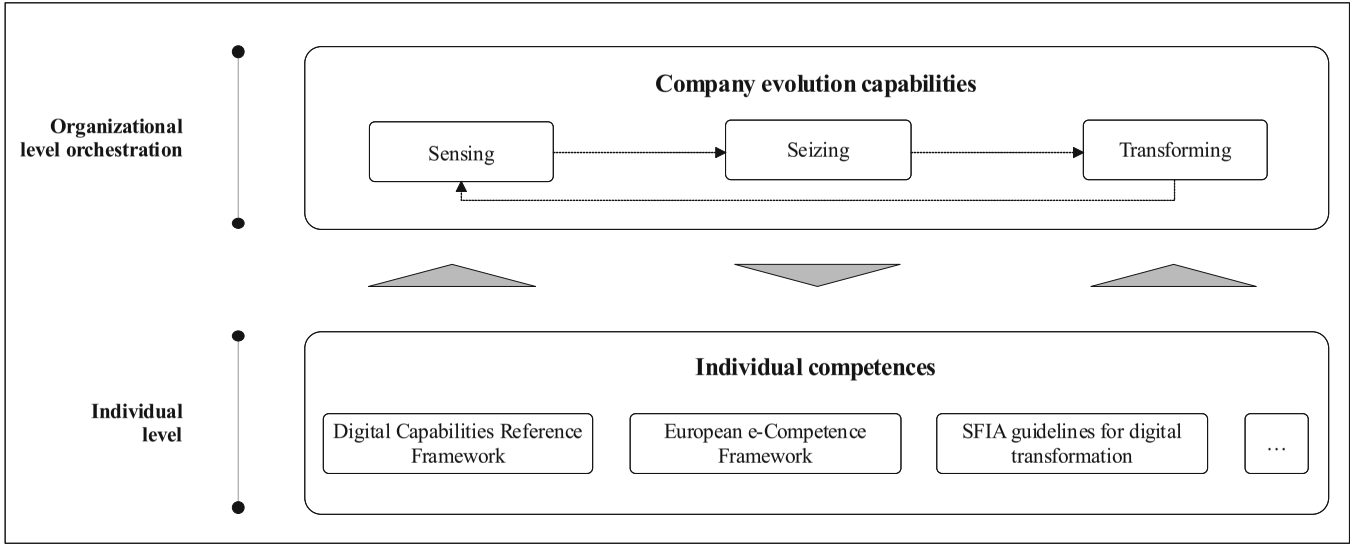

Fig. 1 Individual level competences and organizational capabilities for digital

they all have similar approaches. These companies usually have traditional business functions necessary to coordinate the activities of a complex organization (for instance, brand marketing and finance) but are structured around the idea of "digital products" and "digital product teams." In general, a digital product is any software-enabled product or service that offers some form of utility to a user. Examples come from apps like Uber, Deliveroo, or Airbnb, but also encompass the digital sides of more traditional businesses. The mobile banking app launched by the most traditional of the retail banks is a digital product. Such products need not be comprised of software alone but can be part of a tangible asset as well, for instance, an interactive dashboard in a car or a virtual assistant in a smart speaker. In general, if there is a software component used to satisfy a customer need, we can talk about a digital product.

How do tech companies organize the building and management of digital products? They typically structure digital product teams, which bring together diverse competencies under the common objective of creating a product that maximizes usability for the customer. A single digital product team is rarely responsible for a whole product. Internally, digital products tend to be split into components. They could be divided based on phases of the customer journey (e.g., attract, engage, convert, delight), application technology (e.g., Android, iOS, app, front-end, back-end architecture), and feature (transversal features that are part of different phases of the customers journey). Let's take an e-commerce platform. When you land on the homepage, you are in a phase called "attract." Behind this, there is a product manager and a product team (or, in most cases, product managers and product teams) whose objective is to make sure that you don't leave the page for competitors but proceed to the following step. Once you start browsing the product pages, you pass to a second step, "engage." Product managers in the "engage" phase make sure that your shopping experience is as smooth as possible (the structure of the webpage, reviews, comparisons with other products). When you click the "add to basket" button, you enter the "convert" pillar, with someone else responsible for the check-out and payment procedure. If you then place the order, new product teams come into play, the "delight" teams. They are responsible for customer service, updates, and post-selling services in general.

Of course, global functions remain and ensure firm-level decisions, while coordination functions make sure that final customers perceive a single integrated flow. However, organizing around digital products means that many activities (e.g., marketing) can also be replicated for each subcomponent. This structure is put in place with one main goal. It ensures the creation of a link with the external (customers) and internal environment (business) and the ability to quickly mobilize the right resources and competences to test new ideas and update/reconfigure products based on such evidence.

The structure of a product team is emblematic of how to build the capability to respond to external solicitations (e.g., customer needs, feedback, new trends). Tech companies orchestrate different individual competences; for example, a product team might leverage the following:

- Technical software skills, provided by a development team (front-end, back-end, quality assurance) that codifies product elements and enables their functioning
- User experience skills, provided by a UX (user experience)-UI (user interface) designer, responsible for designing what customers actually see and use in the product
- Data skills, with data analysts in charge of analyzing the inputs coming from the external environment (e.g., customer feedback and behaviors)

Leading the team is the digital product manager, a professional role with its roots in the 1930s but that has deeply evolved in the software world. The digital product manager bridges the gaps between the business direction, technology, and user needs. Their role is to create a synthesis of what comes from the customers, the external market, and the internal stakeholders. In doing so, the digital product manager coordinates a diverse pool of competence provided by individual team members.

It is interesting to study what digital product teams and managers do with the lenses introduced in the previous paragraphs. Since digital products start without a pre-set expiration date, their building and management follows a recursive cycle. Teams need to have the capabilities to sense the external environment, seize the opportunity, and reconfigure their product (or portion of it) accordingly. Product managers and team members observe and study the customer daily. As a young digital product manager reported while talking to the DEVO Lab, "every single thing you find in an app, even the shape and position of a single button, is the output of the job of a digital product manager and digital product team. This team follows you and monitors how you interact with the product in search of constant feedback. All product team members have a single obsession. They wake up asking: How can I make customer experience better today than it was yesterday?" In addition, product managers typically bring the general business vision to the product, ensuring it is aligned with the expectations and perspectives of internal stakeholders. While doing all this, teams "sense" their market and stakeholders. By analyzing data from feedback, they can then "seize" needs and opportunities, mobilizing the right competencies to make the change happen (e.g., UI and software development skills). Once priorities are set, the "reconfiguration" can happen. This typically happens with a trial-and-error approach, usually codified as an "agile methodology." There are many labels attached to this concept that have been widely explored, from Minimum Viable Products, to Agile and Lean Startup methodology. There are differences of course, but the basic idea is well known. Work on the basis of customer feedback and iterate your development cycles to release something in production quickly (usually within weeks) and then test with customers to make it better. Even Richard Teece, one of the fathers of dynamic capabilities, talks about how this methodology has emerged as a standard to target agility in the "reconfiguration" phase, in which the firm transforms through the development of a new product, for instance.

These examples put together the two perspectives on competences we talked about. On one side, the clear need for skilled individual team members, asked to

provide solid know-how. On the other, the need for structures and mechanisms to orchestrate this pool of capabilities, directing efforts towards impact on users. It would be tempting to remain in the golden world of modern tech companies where these approaches are somehow wired into the DNA of the firm. But what about traditional businesses? Those that, most probably don't have (only) fancy software-based digital products in their portfolio but come from legacy value propositions built over decades of history. These are the same companies that have the heavy burden of older systems, organizational structures, and stratified employee groups and competences weighing on their shoulders.

3.2 Competences and Capabilities in Traditional Businesses: Open Points

The problem with the debate over digital transformation, competences, and digital approaches is that it often reads the world from the perspective of modern tech businesses, those that probably have little to "transform" and much to "build." To make what we discussed in the previous paragraphs matter for a wider audience, we need to talk about two open points of attention. The first is about legacy competences and employee groups. The second relates to orchestration capabilities, products, and approaches. Together, they provide some insight into why evolving competences and products to catch the opportunities of the modern digital world is easier said than done.

3.2.1 The Stratification of Individual Legacy Competences and Structures

In 2016, the median employee age at tech companies such as Facebook, LinkedIn, Google, and Apple varied between 27 and 31 years old (Statista 2019). The following year, another report found that Millennials comprised 42.6% of the workforce in the tech industry, compared to 26.1% at non-tech companies. The average manager in the tech industry was also found to be 5 years younger than in other sectors (Visier 2017). In a way, "ageism" in hiring practices has been considered a key issue in the tech industry for several years now. There are many stories of age discrimination lawsuits against well-known tech companies, blamed to be favoring younger applicants and employees over older generations. In 2019, Google settled an age discrimination lawsuit about its hiring practices. More than 200 job seekers over the age of 40 who applied for positions at the company received a settlement of $11 million from the firm (Kelly 2019). Of course, this phenomenon is not unique to the tech industry. Other more traditional sectors, like investment banking for instance, are well known to be the perfect playground for young professionals in their twenties, while it gets more and more difficult to enter the field at a higher age. Nonetheless, tech firms are certainly among the businesses that systematically employ a younger workforce. And here we are talking about well-established businesses, leaving aside a portion of the (generally younger) pool of tech startups. The comparison with other traditional companies is merciless. At a top-ten European

bank, for instance, the average age of a middle manager varied between 46.2 and 51.5 years in 2020. Similarly, the average employee age of the premium car manufacturer Daimler in Germany was 44.7 years in 2018 (Thomasson 2018).

As we discussed at the beginning of the chapter, a young workforce made up of a large percentage of Millennial and Generation Z employees should not be taken as a proxy for how "digital" a company is or can become. Of course, many Millennials and most of Generation Z were kids or young teenagers when the first iPhone came out in 2007. They grew up with social media and digital platforms as part of their DNA. However, it is one thing to be keen on technologies as individual users. It is a totally different story to translate this digital component into an organization that has decades or sometimes centuries of history, with legacy systems, processes, and organizational structures. Despite the fact that young generations are not the saviors of digital transformation, there can be a correlation between the characteristics of your workforce and the ease with which you can build those individual competences, organizational capabilities, and orchestration mechanisms we discussed previously.

The presence of an older and more stratified set of individual competences can pose more challenges. Not only do tech companies feature younger professionals but they also tend to favor a higher rate of renewal. For instance, the average length of service for employees at Google, Amazon, and Apple ranges from 1 to 2 years. The same large European bank we mentioned before states in its official reports that the average length of employment at the company is over 19 years. There are also peaks for given countries and categories that exceed 24 years. Employee loyalty is of course not an issue per se, and tech companies experience serious problems because of their extremely high turnover rates. Still, this is only one simple indication of how traditional companies can have legacy structures and employee groups that are much more consolidated and that can make evolution more difficult.

You can see the investments that firms are mobilizing as a result of these major difficulties in evolving individual competences and corporate culture. In fact, the theme of upskilling and reskilling has become unavoidable for several traditional businesses and high investments are being put on the table. For instance, the large French telco company Orange announced $1.5 billion in investments in reskilling (Orange 2019), while the global consulting firm PwC allocated $3 billion for job training in 2019 (Feloni 2019). In the field of Artificial Intelligence, one of the most debated technologies of recent years, the topic or retraining is deemed central. Over time, it has become more and more apparent how the value brought by AI solutions is only marginally due to the core technology itself. The challenges of scaling AI projects to the whole firm, and the efforts to reengineer processes and make business users familiar with the new solutions are critical success factors for these initiatives. Accordingly, workforce retraining is emerging as a key organizational need. Despite the preference for hiring or partnering with new external talent, the current state of the job market and the need to pursue a mature approach to AI adoption impose the need to focus also on developing learning paths for internal resources. The problem is this transition is seldom smooth and easy to plan and execute.

An interesting example of a highly transformative program comes from a field adjacent to digital, "Agile" management. Three or four years ago, the popular

buzzword "agile" started to go beyond IT and other single-functional areas. The theme of "Agile Scaling" emerged. In a 2017 *HBR* article, the author talks about the Dutch bank ING as a success story for building Agile at scale. The firm understood that Agile is not (only) a methodology but rather a wider mentality, working and managerial approach. For this, they involved their HR in the process, acknowledging that you need the right people for a real (and not only formal) agile transition. To do so, the author explains how, "ING made every employee at its headquarters (nearly 3500 people) re-interview for their job. Staggeringly, 40% of these people ended up in new positions or parted ways with the company. And this result wasn't just about their skill sets. In fact, in many cases the employees' skill sets were still highly relevant. Rather, it was a specific mindset that was lacking—one that could embrace the uncertainty of a software-based organization while seeking out new, better ways to deliver that service. The HR team had to play a major role in understanding what this mindset looked like and how best to determine which staff members possessed it, which could be trained, and which had to be let go" (Gothelf 2017).

Of course, the ING agile transformation is an extreme case. Not all companies (if any) that target any form of digital evolution should think of this approach as a default option. However, it perfectly stresses how the evolution of large firms that carry legacy structures and stratified employee groups can require great effort. Another element of this agile transformation is very consistent with our more general field of "digital evolution." Culture and attitude are crucial to set a real evolutionary path, and not just one that adopts slogans and buzzwords without truly modernizing processes and business models. This shift in mentality and approaches is so important because it serves as the link between the individual level competences and the higher-level firm's capability. It is what makes the orchestration and directing of competences towards a common goal ultimately possible. This is another challenge for traditional businesses. How can individual competences be aggregated, orchestrated, and directed to create and evolve products around customers in fast-changing environments? This is where the second level, the "company's capabilities," comes into play.

3.2.2 Orchestration Capabilities and Experimental Approaches

The minimum viable product philosophy is fascinating. The idea that things can be experimented with using quick-to-gather customer feedback, putting users at the center of refining cycles, has become a bit of a cliché. Taking this view and bringing it to traditional companies, maybe in B2B, is not straightforward. This approach is apparently applicable where product development costs are low, and adjustments have even lower costs (Teece et al. 2016). It is perfect for software products, but might fit a little less with industrial furnaces, automobiles, or airplanes. This stresses how the applicability of a general rule (a so-called "best" practice) is limited, since methodologies depend highly on consistency with their context. However, the basic idea still holds. The approach of sensing the external market, beginning transformation with customers, and leveraging a well-orchestrated set of heterogeneous digital competences can be extended beyond the world of tech companies. But how are traditional companies trying to evolve the boundaries of their organizational

structures in practice? How are they trying to create this higher-level orchestration capability?

As we saw, digital products require technical skills, business understanding, and the ability to create a great user experience, in addition to a general focus on scanning the external environment in search for feedbacks by customers. In a 2019 *MIT Sloan Management Review* article, the authors focus on the story of Schneider Electric, a €26 billion French company founded in 1836 and operating in the iron, steel, and electrical equipment industry (Ross et al. 2019). The firm now claims to offer "intelligent management solutions." When it began its journey of evolution, one of the obstacles encountered by the company was due to its business-unit-oriented structure, which induced a proliferation of initiatives without coordination or big-picture awareness. To overcome this roadblock, Schneider started to work through an internal Digital Service Factory. This central unit helped to sense the internal and external stakeholders and identify similar or recurring ideas that could be beneficial to more than one function. In this phase, the service factory also engaged customers to gather feedback and information early on. If an idea moved forward, the proper resources and competencies were aggregated into a cross-functional team that worked together with the customer to ensure consistency with needs. After the roll-out, a process of incremental improvements and reconfigurations started. This case also offers an interesting example of the importance of mobilizing different competences depending on the case. Schneider realized that the products that involved more strategic energy management decisions required different customer contacts. For these offerings, the firm set up a small, dedicated team of specialized salespeople. When the need arose, these professionals were able to become part of product development teams, bringing their specialized perspective to help build a product that met customer expectations. Similar ways of organizing, aggregating competences in cross-functional teams, and working with a trial-and-error minimum viable product approach are being witnessed in other incumbent players. For instance, in the Italian energy and utilities sector, companies are experimenting with central units in charge of releasing new digital products, within weeks, through cross-functional competences brought together for that purpose.

Trying to synthetize the vast debate on the competences required in the digital world, in a few pages, is extremely complex. In this chapter, we tried to lay some foundations to reflect on this widely debated issue, sourcing from two different but complementary views of competences. On the one hand there is the view of competences and skills of single individuals, from the technical to the relational, which is fundamental in the context of modern IT and digital. On the other hand, there is a more organizational perspective, which stresses the importance of creating organizations with the capability to systematically scan the external environment, select priorities, mobilize the right individual competences, and orchestrate them to drive the result home. Doing this in the context of modern tech companies is surely easier, as they tend to be naturally structured to enable this orchestration and reconfiguration. However, traditional businesses increasingly embrace this mentality as well. This leaves a whole set of open questions in terms of how a non-tech business, which doesn't offer digital products alone and has legacy structures and

competences, can foster the change that this approach requires. The impacts are seen in individual competences and organizational capabilities, as well as leadership style and responsibility. Apparently, people are fascinated by change, but as we will see, resistance and inertia can complicate the process. For this, the next chapter will delve right into the mechanisms of change management in the digital context.

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Enterprise Renewal and Change Management

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Abstract

This chapter explores the challenges of renewal and change management when digital transformation projects take the lead. The change challenge is defined as the transition from the current state to the future state. The current state is the non-digital enterprise, the future state is best represented by the full-digital enterprise, while the post-digital enterprise is the one benefitting of the digital transformations successfully deployed and installed, as well as people's behaviors being consistent with digital technologies in place. Change and renewal strategies have to overcome and contrast resistance: the chapter deals with the fundamental questions of change: they are (a) *what* is change all about? (b) *why* is change needed? (c) *how* will change be processed? (d) *who* will run the change? and (e) *when* is the right moment for change?

1 Introduction: Change and Renewal Defined

Change is a fascinating term that we use pretty much every day in all domains of our existence—the financial, the gastronomic, the romantic, the entertainment, the professional, and more. Still, the change charm is often much awaited but not always welcomed: on paper, change promises innovation will occur, but then it requires adaptation to something new, and this frequently causes resistance.

This chapter is dedicated to change management, applied to organizations as part of a broader perspective on corporate renewals and digital transformation journeys. The subject has been around for a long time, and it is still proof of the need, at all times, to adapt to the environment and the intrinsic difficulty of the challenge.

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Management literature, both in books and journals, has addressed the compelling need to adapt to the environment as the survival instinct for any organization. Renewing your business model and heading toward blue oceans, where competition is almost irrelevant, has been the mantra shared with top management teams by management experts, gurus, and consultants for the last two decades.

There is a good reason for this. The change upsurge came as a counter wave to the infinite literature on strategic management. Ultimately, change has to do with making things happen, because translating good strategies into action doesn't materialize with a magic stick. People must be persuaded to come onboard and coherently behave according to the new plans, and this requires patience, perseverance, and social acumen. Thus, leading change processes is a key to achieving success.

Three parties are involved in change: managers, people, and the whole organization. Managers make a career bet in becoming transformation agents. If they win the game, rewards will be secured. People, as the recipients of the change, hope for a better future. Organizations need to innovate and adjust to market dynamics faster than competitors. In this interplay, leaders have to address the importance of change to ensure tension is channeled for exploring new sources of revenue and implement continuous improvements.

Change and renewal strategies have to overcome and contrast resistance. On the surface, people admired the notions of "progress," "innovation," and "transformation," but what research and management practice has shown is that resistance and organizational inertia delay projects, slow down implementation, and dilute the expected benefits of new strategic propositions.

When it comes to becoming a real full-digital firm (Laudon and Laudon 2019), the story is not much different. Digital transformations are, by all means, change management projects that need adequate adoption to celebrate their full potential.

The change challenge is defined as the transition from the current state to the future state. The current state is the non-digital enterprise; the future state is best represented by the full-digital enterprise, as defined by Laudon and Laudon (2019). The post-digital enterprise is the one benefitting of the digital transformations successfully deployed and installed, as well as people's behaviors being consistent with digital technologies in place.

These transformations are by all means enterprise renewals: Regenerations under the light of a data-driven, digital enabled world that empowers new business models and innovates in the competitive environment. For the sake of clarity, not all corporate renewals are due to digital transformations, i.e., change management projects rolled out to adopt digital technologies. Not surprisingly, as was also covered in this book's first chapter, many corporate renewals entail digital transformation, since the adoption of the digital firm paradigm is yet to be deployed in all economic sectors.

2 When Digital Transformations Become Successful: The Change Perspective

What makes a successful adoption of technologies in organizations has been a long-investigated research question to which answers have been backed up with empirical evidence from pretty much anywhere: different industries, large and small company sizes, and publicly listed or private companies. It all started with the thought-provoking question by 1987 Nobel laureate in economics Robert Solow: "You can see the computer age everywhere but in the productivity statistics," a famous phrase that gave birth to the productivity paradox theory, also named the Solow theory. The notion is quite simple: through empirical testing at a macro level, numbers showed a decline of productivity indicators in the US economy, despite the rapid development of the IT industry.

The Solow paradox generated an entirely new research field that intrigued academics, business journalists, consultants, and managers: What factors can explain a successful—and then "productive"—implementation of IT? Theoretical and empirical models were developed in order to understand the main drivers underlying such adoption processes. Influencing factors have been analyzed in the literature following two different perspectives: the first one is oriented to the study of intra-organizational factors, and what makes the deployment of IT more efficient; the second perspective is focused on environmental factors and is based on new institutional and management fashion theories. Previous chapters of this book have provided wide coverage of the damage caused by the technology hype euphoria. These are overconfidence bubbles with high potential for deception, backfiring on the good intentions that accompany a digital innovation.

After more than two decades of research focusing on the intra-organizational factors that secure a successful implementation of digital solutions, empirical evidence is straightforward: *no digitalization journey can celebrate its success if not simultaneously carried out with a profound business process redesign*. For example, launching a new sales channel, namely, e-commerce, brings to the surface a number of new, overlapping problems that require clear answers. In the case of retail businesses, what if customers shop online but then buy in-store? And what if the reverse is true, they shop in-store and then complete their purchases online? Customer behavior generates interdependencies between the two channels that require strong and fine-tuned coordination mechanisms. Moreover, customer behavior challenges traditional performance measurement metrics: Who was determinant in the transaction, the online unit or the store staff? To whom should the company pay the variable bonus? Omni-channel processes need to be designed from scratch: in other words, opening a digital sales channel is not "yet" another sales channel. Wrong answers to these problems can seriously affect the performance of the new initiative, downgrading the power of the investment in digitalization, diluting its benefits over a longer period of time, and exacerbating internal conflicts between in-store and online teams. Processes must be revisited: in the case of the retail business, there is no possibility of seamless omni-channel customer experience if

data is not integrated, customer management not efficiently centralized, and supply chain logistics are badly designed.

Process re-design drives us back to the change challenge. Designing the to-be world is the first step: what's most important is the transition to the newly desk-defined processes. Thus, change is intimately wired with innovation, renewals, and last but not least, digital transformations. The ability to change can turn these strategies into either a big success or a dramatic failure, and this has to do with human-related factors: people and people dynamics. When it comes to technology introduction, change is the everyday problem. Because of obsolescence, either technical or economical, technology managers have to plan change all the time. Nothing will last forever: there is always a moment in time when there is a need for change, replacing, upgrading, or improving. In this chapter, we explore the change challenge when considering the adoption of digital-based technologies within organizations.

3 What Inhibits Change at the Individual Level? The Seeds of Why People Resist Change

There are many possible answers to the question of "why people resist to change." This paragraph will offer a synthetized view of the problem and the underlying causes.

3.1 Defeating Comfort Zones

The first reason has to do with "comfort zones." Abundance of research in fields such as human behavior, psychology, and neurology has offered a consistent answer to the forming and establishment of comfort zones at the individual level. Neuroscience has proved that the human brain processes positive information differently from the processing of negative information (Sharot 2001), and this is due to (a) the fact that different parts of the brain are intended for different tasks and (b) the imbalance between the two parts. This causes the so-called *optimism bias*, defined as the difference between a person's expectation and the outcome that follows. If expectations are better than reality, the bias is optimistic; if reality is better than expected, the bias is pessimistic. "The extent of the optimism bias is thus measured empirically by recording an individual's expectations before an event unfolds and contrasting those with the outcomes that transpire" (Sharot 2011). "When it comes to predicting what will happen to us tomorrow, next week, or fifty years from now, we overestimate the likelihood of positive events, and underestimate the likelihood of negative events. For example, we underrate our chances of getting divorced, being in a car accident, or suffering from cancer. We also expect to live longer than objective measures would warrant, overestimate our success in the job market, and believe that our children will be especially talented. This phenomenon is known as the optimism

bias, and it is one of the most consistent, prevalent, and robust biases documented in psychology and behavioral economics" (Sharot 2011).

Tali Sharot and her Affective Brain Lab team at University College of London found empirical evidence for the bias, a sort of mechanistic explanation of these observations. "We have found that an optimism bias is maintained in the face of disconfirming evidence because people update their beliefs more in response to positive information about the future than to negative information about the future. We asked participants to estimate their likelihood of encountering different aversive events in their lifetime (such as Alzheimer's disease and burglary) and then presented them with the average frequency of encountering those events. We next asked them to estimate their likelihoods once again in order to test whether they used the information provided to update their beliefs. We found that when individuals received information that was worse than their estimate (for example, when someone estimated their probability of suffering from cancer as 10% and then learned that the average probability was 30%) they did not update their estimate much the second time around. However, if a person initially provided an estimate that was more pessimistic than the information they were subsequently given (for example, they estimated their own probability of suffering from cancer at 40% and then learned that the average probability was 30%), they substantially updated their estimate to more closely match the average probability. Selectively updating beliefs in response to positive information produces optimism that is resistant to change" (Sharot 2011). The reasons why this happens is because of the following: "This selectivity is mediated by a failure of frontal lobe regions to code errors in prediction that would reduce positive expectations. When optimistic individuals are confronted with unexpected statistics about the likelihood of encountering negative events, their right inferior frontal gyrus exhibits reduced coding of information that calls for a negative update. In particular, individuals who score high on a scale measuring trait optimism have a weaker correlation between activity in this region and the extent of negative errors in estimation. But when the information presented is better than expected, regions of the prefrontal cortex code for it efficiently both in highly optimistic and less optimistic individuals. In other words, while coding for positive information about the future is intact, optimism is tied to a failure in updating from (and diminished) neural coding of undesirable information regarding the future" (Sharot 2011).

The optimism bias, being deeply rooted in human brains, is proof of the existence of comfort zones at the individual level. Especially when change is associated with bad news, like a corporate restructuring, it is most likely that the human comfort zone will prevail and make us blind to the upcoming change, thus resisting it. But there is more. These striking results from neuroscience, in the first decade of this century, are contributing evidence to what behavioral scientists and economists investigated 20 years ago. Rewinding back the tape, moving backwards in the timeline, in the late 1970s and early 1980s, traditional economics was literally transfigured by the contribution of psychology by Daniel Kahneman, Nobel Laureate for Economics in 2002, a prized shared with Vernon L. Smith. This is the direct quote from the official motivation for the prize: "For having integrated insights from

psychological research into economic science, especially concerning human judgment and decision-making under uncertainty."

3.2 Coping with Uncertainty: The Role of Heuristics in Decision-Making

Uncertainty has been, for centuries, a somewhat mistreated, although fascinating, construct for statisticians and economists. The dominant ages of Rational Choice Theory, as the only framework for understanding and modeling economic and social behavior, returned one clear verdict: "People have preferences among the available choice alternatives. These preferences are assumed to be complete (the person can always say which of two alternatives they consider preferable or that neither is preferred to the other) and transitive (if option A is preferred over option B and option B is preferred over option C, then A is preferred over C). The rational agent is assumed to take account of available information, probabilities of events, and potential costs and benefits in determining preferences, and to act consistently in choosing the self-determined best choice of action. In simpler terms, this theory dictates that every person, even when carrying out the most mundane of tasks, performs their own personal cost and benefit analysis in order to determine whether the action is worth pursuing for the best possible outcome" (Levin 2002). In other words: uncertainty is not in the vocabulary of the rational agent.

In their seminal paper published in 1974, Amos Tversky and Daniel Kahneman articulated the colossal impact uncertainty has in human decision-making for the first time by flipping the topic over, resuming a discussion of uncertainty, and neglecting it no more by giving it a central role. When uncertainty comes into play, humans are in desperate need of shortcuts to simplify their decision-making: three heuristics are used to tackle difficult judgments.

The first is *representativeness*, usually employed when people are asked to judge the probability that an object or event A belongs to class or process B. In these cases, because of uncertainty and the impossibility of consulting or generating information, we are most likely to judge the extent to which A resembles B, or in other words, is a representative of B. In this exercise we are exposed to stereotyping: A nice shortcut to arrive at an answer without checking.

The second is *availability* of instances or scenarios, which is often employed when people are asked to assess the frequency of a class or the plausibility of a particular development. Humans tend to give more value and importance to the information that is available and easy to access, and tend to give less value and importance to the information that is more difficult to reach and farther away from us (in time/space). This brain bug is the main platform for the development of an entire industry: advertising. Communication experts influence our consumer behavior with product information bombing on all possible channels: TV, newspaper, Internet ads, and targeted social media in more recent times. For example, while doing our grocery shopping, if two products appear to us, A and B, on the same shelf, and they are functionally identical and provocatively have the same price tag, but with a

major difference: we see product A on TV and other ads all the time, while we do not recall any information or promotion regarding product B, the latter being completely unknown. All other things being equal, we are most likely to welcome product A rather than product B into our shopping cart, because we tend to attribute some trust and quality judgment to the product we have heard of. We are most likely to be suspicious of the product we have never heard of, in this case B. Rational Choice Theory would suggest we buy them both, run a blind product test at home, and then make our final judgment by decoupling product functionality from product advertising. On average, because of uncertainty, humans prefer a shortcut, based on available information, and then product A ends up in our consumer basket.

The third heuristic is *adjustment from anchor*, which is usually employed in numerical predictions when a relevant value is available. But anchoring heuristics is part of our life, as well documented by another Economic Science Nobel Laureate of 2017, Richard H. Thaler, whose prize motivation says the following: "For his contributions to behavioral economics." Thaler has considerably broadened the role of anchoring heuristics by proposing a more comprehensive *default theory* as a way to interpret human behavior. We are constantly exposed to anchors: the entire world of digital solutions is a collection of pre-configured anchors that will tell us the fastest and most proficient way to use IT. To show the power of anchoring heuristics, a classic mini-case from an Apple vs Google fight can be recalled. All Apple products with Safari onboard have a pre-configured option to launch Internet searches with Google. Users can change this option by navigating in the configuring pages of their device and opting for another service. It is one of the many changes you may want to adopt when using a new device. How many people are likely to suffer the pain of reconfiguring their device to embracing a new Internet search engine? This was the question when, in 2015, rumors spread about Apple being unwilling to renegotiate the deal with Google. Both business and technology press were in raptures: Is Apple launching its own search engine to compete against Google? How will it look? What will be the beauty of its algorithm? These were all reasonable questions and speculations, since this event recalled one antecedent of the fight between the two giants: the launch of Apple Maps in 2012, competing against Google's. None of the speculation proved true. The real story had to do with anchoring heuristics or default theory. At that time (2015), the privilege of being the preferred—anchored—service on all Apple devices, except for those on sale in China, was valued $1.7 billion per year: Yes, Google was signing a check to Apple every year to be the default search engine. In exchange for this, Mountain View had access to Cupertino's customer base. Were it to break the agreement, Apple would sign a new deal with another search engine provider (i.e., Microsoft or Yahoo), hopefully for a better fee. Here the default theory works in the reverse way: some of the Apple customers buying their new device without Google's search engine would likely accept the new default service, say Bing or Yahoo, as a confirmation of the anchoring heuristics shortcut. However, because of Google's dominant market position in Internet searches, the question was how many new Apple customers would likely suffer the pain of device reconfiguration to access their preferred services, manifesting complaints and switching back to Google? The

number could have been close to 40–70% of the new Apple customer base, according to experts at the time. In this case, the Mountain View giant would still have access to a big slice of Apple customers, without paying anything in exchange. What's the value of this benefit? It is somewhat easy to estimate: Google annual reports will tell you the advertising revenue share coming from different platforms, i.e., an exorbitant advantage in exchange of nothing. The conclusion was a renegotiated agreement for a much higher, undisclosed yearly fee, rumored to be more than the double the previous contract.

The combined effect of the three heuristics ignites *overconfidence*, which makes us blind and dangerously exposed to biases. Optimism by Sharot can be considered the other side of the coin of overconfidence by Kahneman. The two investigations converge, even though departing from opposite epistemological assumptions. Tali Sharot is telling us that optimism/overconfidence is wired into human brains: neuroscientists know which part of the brain enflames its effects. Thus, overconfidence is more proof of a human comfort zone, naturally engineered into human hardware for a number of very good reasons. Tali Sharot says, "The absence of positive expectations of the future is associated with mild depression and anxiety, suggesting that optimism is vital to mental health. However, optimism is also beneficial for physical health. All else being equal, optimists live longer and are healthier. The effects can be quite substantial, with one survey of 97,000 individuals reporting that optimists are 14% less likely to die between the ages of 50 and 65, and 30% less likely to die from cardiac arrest. Optimism has also been related to extended survival times of cancer and AIDS patients. Optimism affects physical health in at least two ways. First, expecting positive outcomes reduces stress and anxiety. This is beneficial given that chronic stress is detrimental to health, causing over-activation of the autonomic nervous system and the hypothalamic-pituitary-adrenocortical axis. Optimists have been reported to catch fewer infectious diseases and have a stronger immune system. Second, it has been suggested that optimism facilitates health-promoting actions. For example, studies show that optimistic patients are more likely to eat healthily and engage in exercise. It seems that the belief in recovery motivates the individual to act in ways that promote it" (Sharot 2011).

3.3 Comparisons with Past Experiences

Another reason for suspicion about change has to do with humans' in-born attitude toward making comparisons with the past. Behavioral economists and psychologists have long investigated the problem, arguing that the propositions of Rational Choice Theory are no longer useful when applied in the real world. In fact, humans make systematic errors in both assessing the probability of events and the value associated to outcomes. Dan Gilbert, psychologist at Harvard University, says, "Estimating odds, as difficult as it may seem, is a piece of cake compared to trying to estimate value: trying to say what something is worth, how much we'll enjoy it, how much pleasure it will give us. How much is a Big Mac worth? Is it worth $25? Most people

have the intuition that it's not—you wouldn't pay that for it. But in fact, to decide whether a Big Mac is worth $25 requires that you ask one, and only one question, which is what else can I do with $25? If you've ever gotten on one of those long-haul flights to Australia and realized that they're not going to serve you any food, but somebody in the row in front of you has just opened the McDonald's bag, and the smell of golden arches is wafting over the seat, you think, I can't do anything else with these $25 for 16 hours. I can't even set it on fire—they took my cigarette lighter! Suddenly, $25 for a Big Mac might be a good deal. On the other hand, if you're visiting an underdeveloped country, and $25 buys you a gourmet meal, it's exorbitant for a Big Mac. Why were you all sure that the answer to the question was no, before I'd even told you anything about the context? Because most people compared the price of this Big Mac to the price they're used to paying. Rather than asking 'What else can I do with my money?' and comparing this investment to other possible investments, you compared it to the past. And this is a systematic error people make. What you knew is, you paid $3 in the past; $25 is outrageous. This tendency to compare to the past is causing people to pass up the better deal. In other words, a good deal that used to be a great deal is not nearly as good as an awful deal that was once a horrible deal. Here's another example of how comparing to the past can befuddle our decisions. Imagine that you're going to the theater. You're on your way to the theater. In your wallet you have a ticket, for which you paid $20. You also have a $20 bill. When you arrive at the theater, you discover that somewhere along the way you've lost the ticket. Would you spend your remaining money on replacing it? Most people answer, no. Now, let's just change one thing in this scenario. You're on your way to the theater, and in your wallet, you have two $20 bills. When you arrive, you discover you've lost one of them. Would you spend your remaining $20 on a ticket? Well, of course, I went to the theater to see the play. What does the loss of $20 along the way have to do? Now, just in case you're not getting it, here's a schematic of what happened: along the way, you lost something. In both cases, it was a piece of paper. In one case, it had a U.S. president on it; in the other case it didn't. What the hell difference should it make? The difference is that when you lost the ticket you say to yourself, I'm not paying twice for the same thing. You compare the cost of the play now—$40—to the cost that it used to have—$20—and you say it's a bad deal. Comparing with the past causes many of the problems that behavioral economists and psychologists identify in people's attempts to assign value" (Malone and Gilbert 1995).

We are continuously exposed to past comparisons: in this type of experience, communication and media play a pivotal role, exerting influence and exposing our attention to easy-to-reach data (*availability heuristics*). If someone has experienced a very negative change challenge in his/her organization in the past, it's very likely that the memory will affect the present. Prejudice is a human fallacy, but it has a gargantuan aftermath with respect to present behavior. Our tendency of comparing with the past can be also interpreted as a *personal defense* mechanism to protect our integrity within the organization.

4 The Hidden Side of Change: Resistance Based at the Organizational Level

Comfort zones are part of human nature, and they play a very important role in keeping us healthy, motivated toward the future, energetic, and willing to explore. But when it comes to making changes within organizations, they become an insurmountable barrier and hard to defeat, especially if they have developed over time and contributed to past success.

Comfort zones originate and nurture within organizations as well: business history abounds with cases of massive wealth dissolved because of the inability to change. Kodak, Blackberry, Blockbuster, Nokia, Motorola, and many others represent testimonials of brands that accumulated economic success, visibility, and customer thankfulness and appreciation over decades, which all vanished when the environmental discontinuity started. Eastman Kodak could have been considered "the Steve Jobs of the 1920s" when he launched the first colored film in 1924. Organizations that build up such remarkable success, anchored to unforgettable innovations launched by their founding fathers, are more likely to end trapped into their comfort zones. The higher the level of success, the stronger the comfort zones; the stronger the comfort zones, the higher the resistance to change.

When adopting an innovative digital solution, because of its power to dismantle the status quo by redesigning new processes and innovating the business model, one should not be surprised to hear complaints like, "nice, but it will not work for us," "why change? Our current solution works perfectly," "yes, but existing customers will not like it," "in this way we will lose control," and "the new system will make us loose our notorious flexibility." Such comments may not only be complaints, but also represent fears of embarking on poorly understood innovations.

Another organizational reason why comfort zones could prevail has to do with middle management. Theories on change management have always described two opposite strategies that follow the hierarchy of any organization: (a) the top-down approach and (b) the bottom-up approach. The differences between the two are quite straightforward. The top-down approach assumes the senior management team plays an active role in designing, promoting, and executing the change. In contrast, the bottom-up approach welcomes the change from the lower part of the organizational pyramid, from those with direct contact with customers, suppliers, and external partners due to their role as executors of all operations. The two have opposing rationales: the top-down is indispensable when a guiding coalition needs to shed light in dark times and give hope for a better future; the bottom-up is best applied when new ideas and views must come from the peripheries of the organization that are more permeable to the environment. Both of these approaches have been criticized as too simplistic and unable to represent what truly happens in the corporate world. Middle-layer managers can exacerbate the comfort zones of the entire company, thus becoming the major obstacle to real change. The *clay metaphor* can help us understand this: like the layer of clay in the soil, middle managers can act as the clay that doesn't allow ground water to penetrate the soil and/or doesn't allow spring water to reach the surface, in both cases working like an obstacle for water

circulation. The translation into the language of corporate business sounds like this: middle managers, as the clay layer of the organization, can obfuscate the good ideas coming from the top management, originally supposed to encourage strategy deployment in the rest of the organization, or, at the same time, the clay can stop good ideas coming up from the bottom when such ideas may have responded to an originally democratic call to the lower part of the organizational hierarchy for contributions.

Why is it that middle management can end up like the layer of clay? Many answers can be found. The following are among the most convincing: plateaued careers that offer no hope for higher advancement can justify this behavior of waiting rather than contributing; a lack of involvement in participating in the future outlook of the organization, which is repeatedly kept at the top level and has never penetrated further; past stories of change failure in which middle managers were the protagonists; organizational immobility over the timeline of product/service lines, revenues, customers, external partners, and more.

Comfort zones at the organizational level encourage the "not invented here syndrome (NIHS)": Lack of involvement, fear of the future, and weak sponsorship from the top amplify resistance, pushing back change rather than welcoming it. And last, but not least, culture should not be underestimated as an additional explanation of resistance. Some cultures more than others do not do enough to combat *fake adopters*: Members of the target population that give signs of being onboard with the change, but in truth are against it. Therefore, another reason for resistance comes from weak deployment of the change initiative: It is not detailed enough, to the extent that fake adopters find fertile ground to flourish. Fake adopters are by all means resistors that disclose their resistance at a later step of the process, while deceiving change leaders at the beginning about their true intentions. Fake adopters constitute a serious problem, acting as a ticking bomb programmed to blast later, thus creating more damage because they are unexpected and unprogrammed.

Individuals, as well as the collective behavior of individuals in organizations, can develop bubbles due to overconfidence and optimism bias. Examples are listed by Tali Sharot: "Underestimating risk may reduce precautionary behavior such as safe sex, attending medical screenings, or buying insurance. It could potentially promote harmful behaviors such as smoking, over-spending, and unhealthy eating due to the optimistic assumptions that unwanted future outcomes (such as lung cancer, bankruptcy, and obesity) are unlikely to materialize and that positive future outcomes (such as earning larger amounts of money) are. Indeed, it has been reported that extreme optimists are more likely to smoke and less likely to save money than mild optimists. These behaviors have traditionally been attributed to temporal discounting (overvaluing the present over the future), but studies show that when optimistic expectations are abolished, these behaviors are reduced. This suggests that choosing to engage in an act that is rewarding at present but costly in the future (smoking, unprotected sex, overeating) can be partially explained by an excess of unrealistic optimism" (Sharot 2011). Behavioral economists have addressed these problems in a similar way. In some circumstances we tend to leverage a psychological protection mechanism, named the *confirmation bias*: it's safer to reject the change and

persevere along the current course of action by finding arguments that confirm the validity of what we have done, rather than generating an opposing viewpoint. Similarly, at the organizational level, the NIH syndrome turns into a bubble: "This will not happen to us," "our customers will never switch to a competitor product," "our sales will stay strong anyway," or "it will take a long time before happening to us." Once again, these seem to be the causes that have brought to failure corporate stories like Kodak, Blackberry, Nokia, and more.

5 The Change Process: Key Questions to Elaborate an Appropriate Strategy

The time has come to investigate how change can be managed in the post-digital world. The following paragraphs will dive into the issue, but there is first a need to clarify the five questions associated with change. They are (a) *what* is change all about? (b) *why* is change needed? (c) *how* will change be processed? (d) *who* will run the change? and (e) *when* is the right moment for change?

5.1 The What

What is the content of the change? What is in fact changing? These are legitimate questions that require us to take a step back. Floods of published material document the large variety of change initiatives and how they can be classified. It's not relevant to replicate this literature here but what is more interesting is to observe the trend. Not surprisingly, a growing segment of the typology of change initiatives has to do with the adoption of digital technologies within organizations. Twenty years back, a very strong trend became popular: The adoption and use of ERP technologies, intended to transform corporate processes and smoothly introduce digital-based automatization for some of them. Then the age of "Internet Business Solutions" (IBS) came to the foreground: Digital technologies powered by the Internet that promised to make miracles in the corporate world. A third mega-trend has to do with network-enabled mobile applications: everything is on-the-go, in our pockets, easy to access, or friendly to use. The last mega-trend is digital transformations, being the overarching conceptual proposition that aims to transform businesses and the economy. What do these trends have in common? When it comes to digital, there is a price to pay: as previously stated, no effective adoption of digital solution can be claimed without reinventing business processes. But effective and renewed business processes, powered by digital solutions, can be very expensive if original processes are not dismissed. For example, a fully digital order entry process assumes a high level of data integration across various functions. If older, manual, paper-based order entry processes are not dismissed, the price to pay is working with two processes that aim to deliver the same output (the order entry), at higher cost, which also includes the maintenance of the two procedures. Digital transformations are often associated with *mission critical* processes that impose a go or no-go decision by cutting the old

legacy in order to truly deploy the expected benefits. This raises the bar of the change challenge: transformations must hit the target, be successful from day one, and avoid being diluted over a longer period of time.

5.2 The Why

Why is change necessary? The answer to this question is often more awaited by the recipient of the change than the change agents, the latter being those that have contributed to designing the to-be processes and thus gathered enough persuading documentation for the reason for the change. A famous quote emerges from the change equation: change happens if the cost of change is acceptable. Originally proposed by Kurt Lewin, the change equation simply makes the point that there must be a good reason to embark on a change. Change happens if (a) there is enough dissatisfaction with the status quo, multiplied by (b) an acceptable and shared vision about the future, multiplied by (c) an agreed process, able to remove obstacles to change. All of this must be higher than the cost of change. The multiplicative nature of the variable means that if any is equal to zero change will not occur (Jarrett 2003).

$$\mathrm{CH} = \mathrm{f}\ (\mathrm{D\ x\ V\ x\ P}) > \mathrm{CoCH}$$

"However, it seems that the popular explanation as to why change succeeds or fails has understated an important factor implicit in Lewin's work, i.e., the role of competing social dynamics, and the forces of resistance, where resistance is the current state and to tackle it head on tends to create an immediate counterforce to maintain the equilibrium" (Jarrett 2003). According to Michael Jarrett, the equation should be rewritten:

$$\mathrm{CH} = \mathrm{f}\ (\mathrm{D\ x\ V\ x\ P\ x\ R}) > \mathrm{CoCH}$$

"There are a number of implications if this additional dimension holds. First, given the implied direction of resistance to be negative, it means that change is always operating with the breaks on. Second, it also implies that resistance is part of the deep, embedded structure of the organization; if you push, it will push back. Finally, we could reframe and understand the purpose of resistance as providing a useful function of continuity and equilibrium for the current state" (Jarrett 2003). One more time: there must be a very good reason to start a change initiative, given all the obstacles described above.

5.3 The How

How will change be managed? What will be the most appropriate change management strategy? Research evidence shows that the mastering of change processes is a gargantuan persuasion exercise, often done one by one as the only way to ensure that members of the target population come aboard. Here, leadership can be the

differentiating factor. The renowned leadership abilities of Sergio Marchionne, CEO of the Fiat Group from 2004 to 2014, then simultaneously CEO of the Chrysler Group from 2009 to 2014, and then CEO of the merger between to two car makers under the new name FCA (from 2014 to 2018), are proof that people will go the extra mile if senior leadership, responsible for the change, place themselves in the fray. Mr. Marchionne, both at Fiat and Chrysler, moved his executive office to the lower floor colonized by product engineers: in both cases, this resulted as a strong symbolic move toward the importance of product quality, as a central part of the rebirth strategy for both Fiat and Chrysler. Mr. Marchionne also used to carry out surprise visits to FCA assembly plants, by welcoming all the 4 AM-shift shop-floor workers with a personal hand shake, immediately after crossing the badging and entry gates. Celebrating achievements and securing early quick wins is also essential ammunition for a successful change. Coming back to the FCA case, at Chrysler in 2012, the company was able to pay back the US government loan (e.g., the Obama administration bail out money for the car industry) 6 years ahead of schedule. This remarkable business result was possible because Chrysler bounced back beautifully from the ashes of bankruptcy in 2009 to the stellar performance of 2011 and 2012, thanks to a very simple recipe: product quality and new communication to consumers. To celebrate this event, Mr. Marchionne and his team decided to gift all the 50,000 Chrysler workers a newly printed pin. The pin had the Chrysler logo and one simple sentence: "I paid back the loan." Another quick win example comes from the same company restructuring story. Refurbishing a car assembly plant is a major effort that needs big capital, engineering, purchasing, installing, testing very sophisticated equipment for automation, and training crowds of workers to expose them to world class manufacturing principles. All of this cannot be achieved in a few weeks, and in the most successful cases it can last more than 18 months, if not stretching to 24 months. To show that the change is real and fast approaching, Mr. Marchionne used to immediately restructure shop-floor workers' restrooms and the main factory cafeteria, both with clean and state-of-the-art equipment. That this was possible in a shorter timeframe generated a positive corollary in the morale and sentiment toward change from all employees. The collection of personal commitment together with small but effective *quick wins* make the leadership role central and prepare the ground to make the change happen.

5.4 The Who

Who are the characters involved in the change? What is their background? How credible are they? This is a two-sided coin: on one side is the change agent team; on the other is the target population, receiving the change.

Becoming a change master is one of the professions of the future; it is becoming a label to put on your business card. Especially when fast-paced transformations are needed to succeed in business, change agents can make the difference. In the most intricate change adventures, the best companies are likely to establish a Change Management Office to exercise the orchestrator role of concurrent change initiatives

	Innovators	Early Majority	Late Majority	Resistors
Low influence / power				
High influence / power				

Fig. 1 Target population segmentation

by giving them the right priority, exposure, and light, acting as a traffic cop in a crowded transformation arena. Orchestrators do make a difference because, as Kahneman illustrated to us, people's attention is mostly absorbed by short-term, easy access, available information.

The other side of the coin has to do with the target population, namely, the recipients of the change. One of the most popular and well-known methodologies to investigate the target population is to run an in-depth *stakeholder analysis*. This enables a categorization of the recipients of the change into four segments: (a) innovators, (b) early majority, (c) late majority, and (d) resistors. With a two-by-four matrix, these four categories can become eight: in fact, a fundamental guiding principle could be whether they are (a) high influence or (b) low influence members of the organization. In the case of a combination of high influence and resistor categorizations, the change agent will be in trouble and in these exceptional circumstances he/she must secure a stamp of approval of their initiative from the top (Fig. 1).

For both cases, high or low influence/power resistors will inevitably absorb more time and resources, which will need adequate planning and strategic allocation in the change management budget.

5.5 The When

When is all this happening? Why now? Why not next year? Research and best business practices abound on this topic, and they all depart from the need to *create a sense of urgency*. The rationale for urgency comes from the comfort zone problem, which often becomes a staging area that people will hardly abandon. One more time, change represents the unchallenged, the unexpected, and assumes you are ready and willing to face uncertainty. On the contrary, the comfort zone is a safe harbor with tranquil waters, predictable events, and little or no dangers.

The sense of urgency can have two sources: One is an objective threat from the environment; the second is an artificial threat deliberately created by the change agents. In both cases, the ultimate aim is to take people out of their comfort zones. In the first case, change can be ignited because of an urgent restructuring to save the company, or due to adjustment required by regulatory agencies, or any other traumatic and unexpected event generating stress from outside. In the second case, the bar is higher: since the environment is not urging change, leaders and change

agents have to take responsibility for starting the change. By creating artificial moments of urgency, leaders opt to raise people's awareness by leveraging the appropriate ammunition: communication and storytelling. Personal credibility and strong commitment are indispensable to persuade the target population: if either of the two is missing or weakly presented, the artificial sense of urgency could backfire on change agents and create even more delusion and stress, thus increasing resistance to change.

6 Can Intuition Prevent Change Agents from Slowing Down the Change Process?

In the 2010 commencement speech Apple's CEO Tim Cook delivered to his alma mater, Auburn University, he made a strong argument in favor of intuition. Cook stated, "My most significant discovery so far in my life was the result of one single decision: My decision to join Apple. Working at Apple was never in any plan that I'd outlined for myself, but was without a doubt, the best decision that I ever made." It was ironic for Cook to make the decision to go to Apple because most advisors told him not to do so. Also, being an engineer, he was taught to make decisions using analytics and not emotions. However, in this case, he used his intuition over analytics. Cook explains the moment like this: "It's hard to know why I listened, I'm not even sure I know today, but no more than five minutes into my initial interview with Steve (Jobs), I wanted to throw caution and logic to the wind and join Apple. My intuition already knew that joining Apple was a once in a lifetime opportunity to work for a creative genius and to be on the executive team that could resurrect a great American company."

Needless to say, if undoubtedly successful managers act this way, intuition should become paramount and turn into the Holy Grail for any future decision-making. Still, this chapter has had plenty of coverage for the dangers of impulsive optimism and uncalculated risk-taking, which can perpetuate behavior in comfort zones, the true reason why organizations are unable to change. When coming to digital transformations, the perils could be even greater because of the technology hype and/or its fashion effects in the business environment. Knowing technologies and respecting them is the only navigation tool that can prevent managers from exacerbating their inner gut feelings and embracing unappropriated transformations.

Neuroscientists have already alerted us: impulsive reactions are part of human nature, and intuition is a strong ally in this picture. None of us would ever propose combatting the human brain fallacy with drugs or other surgical interference as legitimate therapy to cure resistance to change. Unfortunately for change agents, change challenges are not recognized medical pathologies affecting people and organizations. There is only one weapon: awareness. Knowledge is the best ammunition that can allow change agents to strike a balance between intuitive reactions to change processes and protecting us with plans, analysis, control checks, and more.

The effective transition toward the post-digital firm is a problematic recipe of intuition and rationality, where timing issues are often crucial. The price to pay for

having everyone on board can be exorbitant in some cases. The trade-off between gaining full consensus and accelerating the planned transformation needs managerial acumen, experience, and wisdom, and this is the reason why organizational innovations can be explored as a vehicle for successful digital transformations.

7 Facilitating Change Processes: Innovative Organizational Architectures

A number of innovative organizational architectures have emerged over the last few years as responses to the difficulty of implementing transformations. They all address the need of being more agile, result oriented, by striking a balance between control, supervision, and action speed. Case studies abound: they really belong to the entire spectrum of organizations, listed and not listed, government-owned or private, small and large, family run vs professionally run, in pretty much all industries and geographies.

For example, the already quoted case of the Dutch retail bank ING (Chapter "Competences and Capabilities for Digital Value Creation") launched a major customer experience and digital transformation initiative in 2018 by widely adopting agile principles in response to the criticism of existing change management approaches (Moncef and De Pina 2018). Agility is an organization's capability to respond to market changes by rapidly adapting itself and if necessary progressing in a different direction. Agility has been extensively explored by the software industry adopting Kanban, lean management methodologies, and scrums. ING reorganized their central functions around Squads, Chapters, Tribes, and Coaches. At ING, the 350 Squads were formed by nine members from different discipline and backgrounds, all with the same mandate: achieving end-to-end responsibilities for their customer-related mission. Coordination across Squads between members of the same discipline took place in Chapters, the domicile of how jobs should be tackled in data analytics, mortgage requests, and product management. Squads working on an interconnected mission were grouped into a Tribe, a new way of assigning responsibility by business line, like private banking, business loans, etc. Agile Coaches were assigned to each tribe, acting as expert individuals supporting squads and tribes in championing the agile methodology. The result of this architecture was a gradual transition toward a more collaborative culture where individuals were supported in their decision-making and no longer afraid of making mistakes.

One of the major challenges of this kind of reorganization is to complete the show: end-to-end intervention is needed. For example, re-designing the reward system and career development is indispensable to give people a safety net that explains the why and how they are contributing to such a new way of working. What if their squad overperforms consistently? What is the individual payback the company is ready to give? Another major change has to do with a new KPI system able to measure traditional business outcomes through the new organizational architecture. Without a dashboard with all KPIs listed, people will feel abandoned with no direction to go. And what if a major environmental discontinuity happens?

COVID-19 can be an example, but external economic shocks are always possible, as well as new regulatory compliance requests, especially in industries like finance, insurance, telecom, and pharmaceuticals. Business discontinuities often require a full centralization of decision-making powers at the top as a way to assess the level of uncertainty challenged by the environment.

The design of new change management architectures, inspired by agility, result orientation, and extensive cooperation is, in the end, a cultural change within the change, especially if the starting point is on the other side of the spectrum, i.e., hierarchical, silos, and/or a culture of blame. This is a journey that really goes beyond initial needs and requires full awareness of the consequences.

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A Tool for the Boardroom: The Devo Lab Hit Radar

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Abstract

The increasingly important role played by digital technologies in challenging and overcoming consolidated conceptions of business models makes urgent for CIOs to grasp their value to remain competitive. However, being a savvy adopter is hard, as hasty decisions may easily lead to disappointing results and a waste of money. In order to try to solve this issue, the DEVO Lab developed the HIT Radar, a tool to evaluate the impact, ecosystem, and dynamics of digital technological objects for mid- to large-sized enterprises. In the following chapter, we describe the HIT Radar with particular reference to:

- Differences and similarities compared to other technology assessment tools
- Its methodology and the related construction process
- Its main benefits and limitations

1 Choosing the Right Technology: Never an Easy Task

Today, we are undeniably experiencing a period of increasingly blurred lines among business contexts that were once clearly distinct and delineated. In this scenario, digital technologies certainly contribute to challenging and overcoming consolidated conceptions of business models and market competition.

Unfortunately, this process, usually referred to as "digital transformation," is also one of the most hyped concepts around, systematically associated with terms such as "disruptive" and "revolutionary." Consultants and analysts strongly insist on the

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urgency for CIOs of grasping the value of emerging technology trends to remain competitive, but this often leads organizations to rush towards technology solutions only following the buzzwords of the moment such as *Blockchain*, *Artificial Intelligence*, and *Big Data*.

As has already been said in the course of the book, one of the winning factors in establishing a digital transformation plan is that of being a *savvy adopter* of digital technologies. The adoption of new technologies is of course a fundamental part of the corporate digital transformation process, but too often the rush of the race leads C-levels to forget some fundamental economic questions: What is the real value brought by the adoption of technology X? What are the real costs associated with the adoption of technology Y? What is the organizational impact of replacing technology Y with technology Z?

The resulting paradox is that, more and more often, the value of companies is determined by their digital quotient, but at the same time how the implemented technologies work is not clear even within the company itself. It is exactly in this sense that being a savvy adopter makes the difference. Being a savvy adopter means evaluating the adoption of a new technology with extreme attention, in order to avoid hasty decisions that are inconsistent with the organization's overall business strategy, which often result in disappointing results and a waste of money.

However, the adoption process differs from technology to technology, and it is very difficult for any CIO, even the most up to date, to keep up with today's hyperactive tech offering landscape and to figure out which technology represents the best choice for the company. This is not to mention that the words "adoption" and "implementation" translate in practice with various steps, such as research, experimentation, or the launch of pilot projects. Each of these steps has its peculiar advantages and disadvantages, and several companies may have an interest in entering into a certain technology only after a precise threshold of reliability or profitability has been crossed, rather renouncing the benefits of being one of the first adopters.

This decision-making complexity is thus loaded onto the management, which is increasingly divided between the urgent need to invest in new technologies in order to not miss the opportunities associated with them and, on the other hand, the obvious constraints in terms of budget, time, and skills. It is no coincidence that the market has been filled in recent years with tools whose ultimate goal is to help and facilitate managers, in particular Chief Information Officers, with their technology choices.

Since its inception, one of the declared objectives of the DEVO Lab has been to make all C-level executives aware of the economic and organizational impacts of the digital transformation through a clear, management-focused tool: the High Impact Technologies (HIT) Radar.[1] The HIT Radar is a tool to evaluate the impact,

[1] Within the chapter there will be references both to the HIT Radar (as a tool and methodology) and to the DEVO Lab HIT Radar (the tool and methodology as applied by the DEVO Lab). The two terms are not interchangeable: the difference will be clearer to the reader at the end of the chapter.

ecosystem, and dynamics of digital technological objects for mid- to large-sized enterprises, whose center represents the attention span of a board of directors. Within the HIT Radar, a series of particularly relevant technological objects (those defined as "High Impact") are represented as icons in differentiated positions, size, and color, based on their importance to the very same board. In fact, the HIT Radar makes it possible to appreciate both the distance of these objects from becoming available in mature business applications, their speed in approaching this goal, and their potential impact in the short-medium term.

The overall purpose of the HIT Radar is therefore to provide the following:

- Full awareness of the state of the art of emerging technological objects mapped by specialized business analysts and tech/ICT operators
- An updated view of all emerging technological objects across all industries, both close to and far from actual business exploitation
- An objective and scientific approach to technology assessment

To take up this last point, the DEVO Lab has always believed that the value of the HIT Radar was not only in its *own analysis* of each technological object, but rather in the *research methodology* developed to analyze them. In fact, the HIT Radar is based on a solid methodological process based on several steps, partially inspired by the works by Rohrbeck et al. (2006) and Golovatchev et al. (2010). Such steps are as follows:

- *Technology scouting*. The steps that define the sources to use and the objects to analyze, based on the assessment of primary quantitative data and supported by expert interviews and focus groups. Regarding the scouting, particular mention is deserving of the collaboration between the DEVO Lab and the Civic Design Initiative of the Massachusetts Institute of Technology (MIT), which participate in the scouting process, validating and expanding the selection of technologies considered.
- *Taxonomy classification*. The process that allows the clear identification and categorization of the collected technological objects. The HIT Radar presents a clear and concise taxonomy that enables the accurate highlighting of the relationships between different technological objects such as macro-trends and business models, applications, technologies, and their basic building blocks.
- *Technology selection and clustering*. The process that enables the selection of the relevant technological objects (among those identified in the scouting phase and categorized in the taxonomic framework) and the allocation of them into reasonable macro-classes.
- *Assessment and positioning*. The process of evaluation and positioning of the technological objects on the radar, based on three dimensions (distance, speed, and impact), and their related indicators.

During the chapter, each of the steps that characterize the HIT Radar creation process will be explored in detail, after an initial paragraph in which we will try to

further explain the need for a similar tool by highlighting the gaps found in other homologous instruments. The final part of the chapter will instead be dedicated to a different purpose: Understanding how the HIT Radar can be deployed by users other than the DEVO Lab.

2 The HIT Radar: Why?

The HIT Radar is not the first tool created to support C-levels, and Chief Information Officers in particular, in their operational choices, and it will almost certainly not be the last.

One of the most famous examples in this sense is the Hype Cycle by Gartner. Gartner began publishing Hype Cycles in 1995, to describe the cyclical trend of technologies between hype, disillusionment, and actual delivery of results, and today publishes more than 90 versions of it for each of the market branches that it analyzes. Gartner's Hype Cycles help to position technologies on a time scale, assuming the existence of a cycle that can be summarized in five main phases:

- Technology Trigger: Technology launch, development of the first proof of concept, and first attention received from the media.
- Peak of Inflated Expectations: Birth of the first success stories, often pushed to incredible levels by the media. Failure cases tend to be ignored, and the narrative of technology as fundamental and revolutionary is perpetuated.
- Trough of Disillusionment: The cases of implementation failure become too many to ignore, and as a result, the technology gradually ends up in a vortex of negativity, with most people believing it has few or none of the revolutionary features it was supposed to own.
- Slope of Enlightenment: The ways in which the technology can actually bring a competitive advantage to an organization that adopts and implements it correctly begin to become increasingly clear and defined.
- Plateau of Productivity: The real use cases of the technology become clear to everyone, as well as the benefits associated with them. A stable supply and demand market is created, and vendor reliability criteria are defined, as well as the terms of service related to technology.

The Gartner Hype Cycle (GHC) introduces some concepts incredibly useful for a CIO who must evaluate the adoption of a new technology. First, it allows the visualization of the concept of time in relation to adoption: a technology could have zero value for a company in the technology trigger phase, but may become interesting after entering the slope of enlightenment. A second fundamental concept, mentioned in the name of the tool itself, is that of hype: a company X, interested in playing the role of the early adopter of a technology, could be interested in entering the market in the initial stages already; thanks to the GHC, it will probably manage the excitement and disillusionment related to the peak of inflated expectations and the trough of disillusionment with greater rationality and lucidity.

However, the GHC also shows weaknesses that undermine its effectiveness and accuracy. For example, the objects that populate the GHC curve are not identified according to a detailed enough taxonomy, and this makes it difficult to establish a perimeter between technological objects that are very different from each other (e.g., "DNA Computing and Storage" and "Bring Your Own Identity," both mentioned in the 2020 Hype Cycle for Emerging Technologies). Moreover, while addressing the hype element is important to show the actual progress of a technology, it should be always remembered that the latter is a purely social factor, and therefore very difficult to objectively or technically measure. As a result, the GHC also provides little information on how or when a certain technology could exit the current cycle phase to move onto the next, precisely because hype moves irrationally compared to the expected technical progress.

Another interesting tool that needs a mention is the ThoughtWorks Technology Radar (TTR), realized since 2010 by the software consultancy agency ThoughtWorks. In the TTR, four different categories of technological objects, defined as "blips" (Techniques, Tools, Platforms, and Languages and Frameworks), are positioned inside a radar which gives an idea of their distance from the final user. The TTR is divided into four quadrants:

- Adopt, which indicates that the blip in question is ready for corporate use
- Trial, which indicates that the blip is nearing full maturity and deserves to be tested in practice
- Assess, which indicates that the blip is approaching real use cases but is probably not yet ready, with the possible exception of specific niches
- Hold, which indicates that the blip is recognized in the industry, but could present lots of both technical and non-technical issues

Compared to the GHC, the TTR enables the positioning of technological objects on a scale that, although qualitative, already contains useful indications for the company (adopt, try, assess, hold). These recommendations allow readers to be indirectly aware of the current hype surrounding a technological object (e.g., when looking at a "blip" that is already well-known in the industry but still signaled in the "Hold" sector), and at the same time to better understand what actions to take towards them.

However, the TTR presents some shortcomings as well. As for the GHC, in the TTR the families of technological objects are not clearly defined. The distinction in the four categories mentioned above (Techniques, Tools, Platforms, and Languages and Frameworks) partially helps in classifying the "blips," but the principle that determine what objects can enter the TTR remains vague. Furthermore, another limit in common with the Hype Cycle is that the variables that determine why a blip is positioned in one quadrant rather than another are not entirely clear.

As a third limit, all "blips" are objects developed by one or more vendors, or in any case open tools and instruments that are already in use by the industry: this means that (unlike the GHC) the TTR does not take into consideration technological

Table 1 Main limitations of reports and tools dealing with the identification of emerging technologies

Limit	Description
Absence of taxonomic classification	Technological objects are analyzed and compared even when they belong to very different categories (e.g., Smart Cities vs. Internet of Things vs. 5G)
Lack of business indication	Technological objects are examined in detail, but it is not clear how an organization should act towards them
Lack of evaluation methodology	The elements that determine the maturity of a technology are not described or formalized, preventing organizations from further customizing the analyses on the basis of their needs
Unclear entry barrier	There is no clarity regarding the factors that determine why a given technological object should be considered in the analysis
Narrow focus	The analysis is focused exclusively on a specific technological object, or on its use in a specific sector, or on some aspects that concern its maturity

objects more distant in time, or whose use cases have been theorized but not yet implemented.

In addition to the GHC and the TTR, on the market there are a plurality of reports and studies carried out by consulting companies (e.g., McKinsey, Deloitte, KPMG, PriceWaterhouseCoopers, and Boston Consulting Group), academic and public institutions (e.g., IEEE, European Commission, and the World Economic Forum), and technology providers (e.g., Accenture, Microsoft, and SAP) that deal with emerging and high-impact technologies. Such reports often provide very valid insights, but their main limitation is that they either focus on a single technological object, on its application in a specific vertical sector, or take into consideration only some aspects of its overall maturity. For example, IEEE-branded reports very often provide a complete overview of the technical development of a given technological object, but say almost nothing about its business or legal aspects. On the contrary, many consulting firms focus on the object's possible use cases, without placing too much emphasis on what is currently technically feasible, with the risk of creating the hype phenomenon that has been mentioned before.

In the HIT radar, the DEVO Lab attempted to overcome the limitations presented so far (summarized in Table 1) through a methodological process structured in four phases. In the next section, we will examine these phases in detail and how each of them obviates one of the limits identified in this paragraph.

3 First Step: Technology Scouting

The first phase of the methodological process that gives life to the HIT Radar is the so-called technology scouting. This step defines the sources that will be used to gather the technological objects to analyze, thus effectively representing the entry mechanism that determines what falls within the scope of the Radar. The scouting is

particularly relevant for the purposes of the HIT Radar as it allows us to get two differential traits compared to similar tools:

1. Objectivity in choosing the technological objects. In many tools similar to the HIT Radar, the technological objects that must become part of the analysis are chosen by the analysts themselves, according to their competences and experience. Although this method may be practical for the purposes of collecting the objects, it is often subjective, and obviously strongly influenced by elements such as the knowledge of certain fields and sectors. On the contrary, in technology scouting a certain number of independent sources are considered, and selected to ensure adherence and coverage of all the areas of investigation that the HIT Radar will then explore. In this sense, the source selection process is partially inspired by a systematic literature review methodology widely used in the academic field, which guarantees both a solid basis and a significant degree of objectivity to the work.
2. Holistic overview of all aspects that determine the maturity of a technological object. As anticipated in the previous paragraph, several tech reports focus exclusively on a specific aspect of a technological object (technical, legal, business). The mix of sources selected in the technology scouting allows us instead to adequately cover all the areas under investigation, thus enabling a comprehensive perspective on the technological objects analyzed.

The selection of the sources to be considered in the technology scouting, of course, remains subject to the decisions of those responsible for preparing the HIT Radar. In order to be included in the final list, the preliminarily selected sources must meet a series of inclusion criteria:

- Included sources must have supranational/global relevance.
- Included sources must be published by internationally recognized firms/institutions.
- Included sources must be published in English.
- Included sources must have been published in the previous year.

The primary purpose of the inclusion criteria is to (obviously) eliminate all those sources that could influence the objectivity of the Radar (e.g., local information sources biased towards the situation of a specific nation). At the same time, criteria are not overly restrictive: For example, both qualitative and quantitative-based sources can enter the final selection. The choice of not excessively restricting the research field is fundamental to ensure a full overview of the global technological landscape. Otherwise, a consistent amount of information would inevitably be lost (e.g., most analysis of emerging technologies, which, by their very nature, are not yet supported by quantitative data). The selection resulting from the process is validated by both DEVO Members—who also have the opportunity to play a more active role by suggesting the inclusion of further sources that they deem relevant—and by a group of Bocconi researchers external to the Lab.

Fig. 1 DEVO Lab's sources for scouting technology, HIT Radar seventh edition (2020)

Over the years, the DEVO Lab has continuously tried to expand the coverage in the three main areas of investigation (technical, legal, business), as well as the quality of the sources used. Thus, we moved from the 30 sources and 39 reports used for the first DEVO Lab HIT Radar scouting to 34 sources and 107 reports, respectively, for its seventh edition, published in July 2020.

DEVO Lab sources can be broadly clustered into four categories:

- Consulting companies, banks, and specialized analysists: Boston Consulting Group, CB Insights, Deloitte, Gartner, Goldman Sachs, McKinsey & Company, Morgan Stanley, Price Waterhouse Coopers
- Technology providers and system integrators: Accenture, Atos, Capgemini, Hitachi Solutions, Kellton Tech, Microsoft, SAP
- Public institutions, international think tanks, and associations: EDSO, ETSOE, IEA, European Commission, European Investment Bank, IRENA, ITU, UK Home Office, World Economic Forum
- General purpose, business, and technology-oriented press: *American Banker*, Bloomberg, *Forbes*, *HealthTech*, *IndustryWeek*, *InformationAge*, *MIT Technology Review*, *ScienceDaily*, *TechRadar*

As can be observed by looking at the list of sources, the DEVO Lab HIT Radar actually incorporates the analysis of similar tools such as Gartner's Hype Cycle, which is used as one of the sources in the technology scouting phase (Fig. 1).

Also, in addition to the sources cited so far, in the last few years the DEVO Lab has had the opportunity to work closely with the Massachusetts Institute of Technology, and in particular with its Civic Design Initiative (CDI, previously part of the MIT Media Lab). The partnership with MIT was not fortuitous: the DEVO decided to rely on the MIT to take advantage of the renowned reputation and expertise of the US university in the field of developing cutting-edge technologies, particularly those that are today more distant from business exploitation. In this sense, the partnership with the CDI, whose main purpose is that of designing inclusive organizations that are technologically enhanced and human-centered, has provided an ideal connection between a university like the MIT, typically oriented to investigate the technical aspect of technologies, and a more business-oriented reality such as the SDA Bocconi School of Management.

This partnership translated into several internal workshops held by MIT technology experts and joint workshops among the CDI and the DEVO Lab core team, held annually in the first semester of the year in Boston, Massachusetts.

During the workshops, the list of sources selected by the DEVO Lab in the initial scouting work was confirmed and eventually improved thanks to the confirmation rounds with the CDI.

4 Second Step: Taxonomy Classification

The taxonomy classification represents the second step in the HIT Radar creation process. The need for a technological taxonomy arises from one of the biggest limits mentioned in the previous paragraph, shared by most of the reports examined in the scouting phase: The heterogeneity of the technological objects examined. In fact, in most of the reports, technological objects belonging to very different domains of the technological universe are considered to be the part of the same "family." This limit was addressed in the HIT Radar thanks to the introduction of a classification framework consisting of five layers: building blocks, technologies, clusters, applications, and trends.

This taxonomy is partially inspired by previous works focused on the characterization and standardization of the elements belonging to a given technological domain. For example, one of the most famous frameworks in this sense is the one introduced by the International Telecommunication Union (ITU) as a basis for their reference model for smart objects in the IoT world. In the framework, presented in the 2012 (Recommendation ITU-T Y. 2060 2012), the ITU suggests the cataloging of objects in the Internet-of-Things domain into four categories: devices, communication technologies (network layer), applications, and applications' support services. This is while addressing in parallel the managerial and security capabilities needed to make everything work. In a subsequent review of the framework, presented by Vermesan and Friess (Vermesan and Friess 2014), the two authors also introduce the concept of generic macro-trends within the framework (Fig. 2).

The five taxonomic layers of the HIT Radar (Fig. 3) are partially inspired by this framework, with the main differences regarding the nature of the objects catalogued and the wider analysis range of the tool. In fact, starting from the bottom, the HIT Radar takes into consideration the following layers:

- *Building block*. The building block layer encompasses all the hardware objects that enable one or more technologies, similarly to what the sensors/actuators represent in an IoT context. To remain within the field of the Internet of Things, radio chips mounted inside "smart" objects are a perfect example of a building block.
- *Technology*. Referring to the definition provided by Merriam-Webster (n.d.), technology is *a manner of accomplishing a task especially using technical processes, methods, or knowledge.* Accordingly, this layer includes the sum of

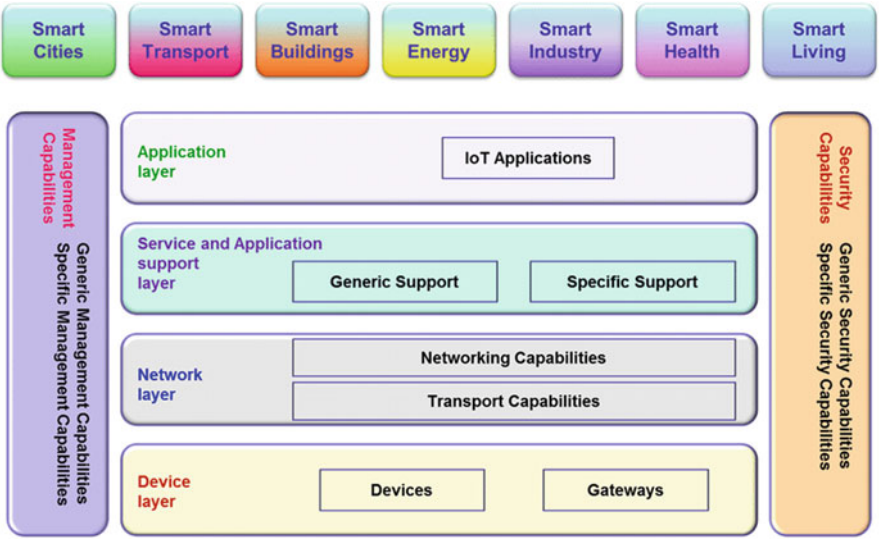

Fig. 2 The ITU Internet-of-Things architectural framework, as interpreted by Vermesan and Friess (2014)

techniques, methodologies, knowledge, and standards used to accomplish a given task. 5G is an example of an object that belongs to this layer.

- *Cluster*. Less "scientific" in nature than the two layers described so far, the cluster layer includes technological objects that can be considered "groups" or "families" of technologies. In line with the previous examples, the Internet of Things can be considered a cluster that acts as an umbrella term for many technologies (Wi-Fi, Bluetooth, LoRa, Sigfox, 5G, etc.).
- *Application*. The application layer includes all the combination of technologies that can be used to provide a useful service/product to a final user. For example, Smart Metering is an application which makes use of some technologies of the IoT cluster to record a series of signals (e.g., energy consumption).
- *Trend*. Finally, the upper layer of the Radar taxonomy includes all the so-called technological macro trends, that is, the set of technological applications that aim at a well-defined purpose. For example, Smart Metering, together with other applications such as Smart Parking, Smart Waste Management, Smart Lighting, constitutes a macro-trend that has been widely discussed in recent years: the Smart City.

In the latest edition of the HIT Radar, the technology scouting brought to light 458 raw technological items, which were then distributed among the various layers of the DEVO Lab taxonomy as follows:

- Macro trends and business models: 31%
- Applications: 25%

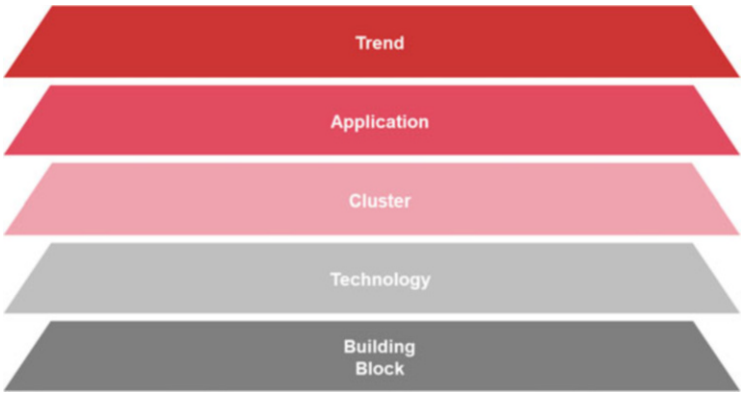

Fig. 3 The HIT Radar taxonomy framework

- Clusters: 3%
- Technologies: 26%
- Building blocks: 15%

The multi-layer approach provided by the taxonomy represents a significant contribution of the HIT Radar to the research field, as it allows us to at least partially clarify the complexity embedded in the digital transformation domain. Indeed, the taxonomy represents the foundation for a technology glossary that could enable a clear and precise hierarchization and ordering of technological objects, concepts, and trends.

5 Third Step: Technology Selection and Clustering

The third step in the HIT Radar creation consists of narrowing the investigation focus to a specific selection of technological objects, typically belonging to the same layer. Of the five layers illustrated in the previous paragraph, the DEVO Lab chose to focus in particular on layers 2 (technologies) and 3 (clusters).

The choice to focus on layers 2 and 3, as well as the selection of specific technological clusters to be analyzed, is a choice that the DEVO Lab makes in relation to its specific interests. In particular, the choice to focus on layers 2 and 3 is motivated by the fact that, typically, the attention span of a corporate board and of C-Level executives who are not CIOs does not dive much deeper than this layer, which represents the boundary line between the technology domain (below layer 2) and the business domain (above layer 2). The DEVO Lab has therefore chosen this level of investigation so that, starting from this level of analysis, all board members and executives can have a clear view of possible drill-downs and zoom-outs on technologies, in order to quickly evaluate what kind of decisions should be taken at a

certain point in time. On the contrary, the decision to exclude some technological clusters arose from the lack of interest of the DEVO Lab in certain areas.[2]

However, the choices of the DEVO Lab do not translate into a compulsory decision: as will be explained more in detail in the last paragraph of this chapter, other companies willing to use the HIT Radar as a tool for technological investigation could opt for a focus on layer 4, or rather choose different technological clusters. This breadth is another element that makes the HIT Radar different from similar analysis tools, especially those focused on a specific technological object or sector: the HIT Radar *can* be specialized, but in its methodological formulation it remains unchanged, whatever its focus.

The practical result of the technology selection and clustering process is to further filter the objects identified in the scouting. After having collected the technological objects in the scouting phase and catalogued them in a taxonomic framework, the DEVO Lab can finally operate with a selection of items clearly identified in layers, which do not overlap with each other. By selecting only those technologies which are worth managerial considerations within the next 5 years, the DEVO Lab eventually ends up identifying a series of technologies and clusters to analyze. For example, the latest edition of the DEVO Lab HIT Radar provides the following distribution of clusters and technologies (Fig. 4):

- Artificial Intelligence: Intelligent Vision, Machine Learning Analytics, Natural Language Processing
- Human Augmentation: Augmented Reality, Virtual Reality
- Computing and Storage Infrastructure: Distributed Ledger Technologies, Open Blockchain, Quantum Annealing, General-purpose Quantum Computing, DNA Data Storage, Edge Computing
- Network and Communication: 5G, Long-range IoT, Short-range IoT, Small Internet Satellites
- Materials Printing: Enterprise 3D printing
- Advanced Robotics: Collaborative Robotics, Drone Robotics

6 Fourth Step: Assessment and Positioning

The fourth and final phase of the HIT Radar creation process consists of assessing the different technological objects analyzed and finally positioning them within the Radar. To be positioned, each technology is assessed on the basis of the three dimensions. In fact, the whole HIT Radar methodology is built both conceptually and quantitatively around these three pillars, which are well represented by the visual elements of the radar (i.e., the rings, the icon dimension, and the icon color). These pillars are as follows:

[2] Typically, those in the biotechnology field such as Molecular Medicine, which are surely innovative and high-impact but that are also far from the Lab's core capabilities and interests.

Fig. 4 The DEVO Lab technology selection, HIT Radar seventh edition (2020)

- *Distance* (indicated by the rings). The distance measures how far a certain technological object is from being successfully adopted, with respect to the current characteristics of the economic, regulatory, and business context.
- *Impact* (indicated by the size of the icon). The impact measures how much the implementation of a given technological object can affect an organization, at an economic, organizational, and risk level.
- *Speed* (indicated by the color of the icon). The speed measures how fast the technological object under investigation is moving towards the center of the radar (the area of adoption), both in terms of investments and regulatory and infrastructural evolution.

6.1 Distance

Distance is probably the most important element to evaluate in the HIT Radar assessment phase. Its importance is due to the fact that the distance is the element that can really make the C-level more aware of the best action to take regarding a particular technological object.

The idea behind this indicator is that instead of the intensity of the "talk," the key point for executives should be to understand whether technologies will make it to the "walk," i.e., becoming or supporting concrete and impactful business applications. Should business strategists seriously care about them or can they avoid further information load and ignore the buzz? How much urgency is actually there to take action toward a specific technology solution?

The Distance dimension of the HIT Radar aims to tackle this issue by considering multiple levels of contextual fit for high-impact technologies. Indeed, a wide range of elements is necessary to support the expression of the full potential of such technologies, such as complementary physical infrastructures, norms addressing the use of the technology and technical competences in terms of the technology's characteristics and exploitation. Thus, the Distance score of the HIT Radar results from the scores assigned to the following six indicators (summarized in Table 2):

I. *Technology maturity*: Measures the current state of development of the technological object. In this sense, the concept of technology maturity refers to technical maturity or readiness, rather than to a broader technological maturity.
II. *Infrastructure coherence*: Measures the current level of fit between the technological infrastructure of the organization and the technological object. This element is often decisive when taking a business decision, especially when examining organizations that start with a below par technological infrastructure: for example, despite being a relatively mature technology, cloud computing will certainly be more difficult to implement in an organization that does not have access to optical fiber connections.
III. *Legal and regulation*: Measures the current level of fit between existing laws and regulations and the implementation of the technological object. Often ignored in many technological analyses, the legal element is instead key when

Table 2 HIT Radar—Distance indicators

Indicator	Description	Evaluation scale
Technology maturity	Current level of technical maturity of the analyzed object	1 = Research 2 = BETA 3 = Early availability 4 = General availability 5 = Mature
Infrastructure coherence	Level of fit between the currently existing infrastructures and the analyzed object	1 = Hostile 2 = Unfavorable 3 = Neutral 4 = Enabling 5 = Perfect fit
Legal and regulation	Level of fit of laws and regulations currently influencing the implementation of the analyzed object	1 = Hostile 2 = Unfavorable 3 = Neutral 4 = Enabling 5 = Perfect fit
Financial compatibility	Current level of financial feasibility (i.e., implementation is possible without incurring economic troubles)	1 = (almost) None 2 = Low 3 = Average 4 = High 5 = Universal
Skills and knowledge	Level of already existing competences needed to properly manage the analyzed object	1 = None 2 = Basics 3 = Practitioner 4 = Professional 5 = Master
Business model coherence	Level of fit between the current business model and the analyzed object	1 = Hostile 2 = Unfavorable 3 = Neutral 4 = Enabling 5 = Perfect fit

it comes to the implementation of new technologies, especially those with a higher impact. A perfect example is drone delivery: the application is quite mature from a technical point of view, and Amazon has tried for years to implement it in its business model, only to be held back by US policies that regulate remote-controlled flying objects.

IV. *Financial compatibility*: Measures the current level of financial feasibility of the implementation of the technological object (i.e., the possibility to implement it without incurring economic troubles). The level of financial feasibility depends on the subjective situation of a specific organization to a much greater extent than the other elements of the analysis. For this reason, the members of the DEVO Lab have long debated whether to include this variable within the HIT Radar analysis framework or not. However, from a practitioner point of view, it is undeniable that the sheer cost of implementation represents a fundamental

discriminant for the adoption of a new technology. The financial feasibility analysis factor was therefore introduced in the HIT Radar methodology, starting from its sixth edition.

V. *Skills and knowledge*: Measures the presence and consistency in the organization of all the skills needed to properly manage the technological object. Again, the element incorporates a point of view typically ignored by purely technical maturity reports: in most cases, innovative and high-impact technologies require skills that are not present in the company to be implemented correctly. A famous example is the case of data scientists, or rather data science teams, absent in most companies and yet real key enablers for most applications based on Big Data and Machine Learning.
VI. *Business model coherence*: Measures the current level of fit between the business model of the organization and the technological object. This variable incorporates an element that is difficult to examine when thinking only in terms of technical maturity. For example, enterprise 3D printing is a technology whose operating paradigm is very close to companies in the manufacturing sector, but very distant from companies operating in other sectors.

From a visual point of view, the distance of the icon from the center of the Radar proves very useful to understand how far a technological object is from the attention span of an organization's board of directors. In the graphical representation, ranging from outer to inner, there are four rings:

- *Out of range*: the board should not take care of the technological object (the gap is too wide).
- *Explore*: the board should not really care about business implementations of the technological object at the moment, but rather become more aware of its characteristics and its progress in the business context (the gap is wide but starting to gather education and skills may be necessary).
- *Experiment*: the board should consider the strategic relevance of the technological object for the company and thoroughly evaluate its integration in the company's business model (the gap is narrow and there is a concrete chance for trial and even for implementation, in specific cases).
- *Adopt*: the board must absolutely consider the technological object's role in providing a competitive advantage for the organization (the gap is none or minimal and adoption is starting to become widespread in the industry).

6.2 Impact

Impact is the dimension of the HIT Radar that aims to measure a critical aspect for technological objects in a business context, and precisely the impact that they are going to generate once implemented. As for Distance, it is possible to apply different levels of analysis for Impact as well.

Table 3 HIT Radar—Impact indicators

Indicator	Description	Evaluation scale
Economic impact	Potential impact of the analyzed object in terms of costs, revenues, and company value	1 = None 2 = Marginal 3 = Moderate 4 = High 5 = Radical
Organizational impact	Potential impact of the analyzed object on the organizational structure of the company	1 = None 2 = Marginal 3 = Moderate 4 = High 5 = Radical
Accountability	Potential impact of the analyzed object on the governance of the company	1 = None 2 = Marginal 3 = Moderate 4 = High 5 = Radical

A first level of analysis is obviously economic: How relevant the object is for the enterprise in terms of revenue or cost advantage (and company value generation in general), which, in turn, may depend on how broadly the technology solution is adopted in the market and how mature it is, and thus how reliable and predictable its outputs are. Further, as modern technologies allow for greater productivity or substitute employees' actions in executing tasks, the implications on the human factor need specific consideration. As a result, Impact is determined from the scores assigned to the following three indicators (summarized in Table 3):

I. *Economic impact*: Measures the potential impact of the technological object on the company in terms of costs, revenues, and company value. As for revenues, an important clarification must be made; in order to avoid implausible calculations, only the potential effects in the short-medium term are considered (i.e., those happening within 5 years from implementation).
II. *Organizational impact*: Measures the potential impact of the technological object on the organizational structure of the company. The organizational impact is an element that is often underestimated compared to the economic one, but in many cases the success of the implementation of a new technology depends on it. An example is the integration required between OT and IT to successfully manage most Internet of Things technologies, or the need to reorganize the management at the edge of the organization when adopting edge computing.
III. *Accountability*: Measures the potential impact of the technological object on the governance of the company, especially in terms of managerial responsibilities. In many cases, the implementation of new technologies does not have very clear consequences at the accountability level and produces little if any effect in changing the hierarchy of the organization. On a practical level, however, the

impact produced by such implementations can be extremely significant: Some examples are the implementation of Internet of Things technologies that necessarily require the creation or strengthening of a cyber-security team, or the adoption of technologies such as blockchain, difficult to frame today in a well-defined context of Quality of Service (QoS).

Impact is represented on the radar by the size of the icons. The current formulation of the Radar takes into account a five-point scale for the Impact dimension. Such levels are, from the smallest to the biggest:

- Very Low
- Low
- Mid
- High
- Very High

6.3 Speed

Technology is an ever-changing field. While the Distance dimension analyzes the current situation of a given technology solution, the Speed dimension provides a future perspective on how this will evolve in the coming years, making it increasingly (or decreasingly) relevant to business strategists. Speed takes into consideration, in a similar way to Distance, elements of both an economic, regulatory, and business nature.

The Speed dimension scoring results from the following five indicators (summarized in Table 4):

I. *Infrastructure trends*: Measures how fast the company infrastructure is evolving to meet the requirements needed to host or work with the technological object. This is strictly related to the "Infrastructure coherence" indicator in the Distance dimension.
II. *Legal and regulation evolution*: Measures how fast the legal and regulatory situation pertinent to the technological object is changing. As has already been said for the "Legal and Regulation" indicator for the Distance dimension, the regulatory landscape is often key for the successful implementation of a new technology. Therefore, it is equally important to understand at what pace the evolution of the regulatory situation is progressing.
III. *Level of market investments*: Measures the current level of market investments feeding the adoption and development growth of the technological object. In fact, the market often proves to be a good proxy to understand how fast a technological object is developing: the evolutionary process of many high impact technological objects that have emerged in recent years can be largely retraced to the investments of both startups and incumbents that started working with it.

Table 4 HIT Radar—Speed indicators

Indicator	Description	Evaluation scale
Infrastructure trends	Current trend of change in the infrastructure's adequacy to host or work with the analyzed object	1 = Divestment 2 = Maintenance 3 = Incremental 4 = Sustained 5 = Massive
Legal and regulation evolution	Current trend of change in the legal and regulatory approaches to the analyzed object	1 = No change 2 = Thoughts 3 = Debate 4 = Ongoing reform 5 = Ready for approval
Level of market investments	Current level of market investments feeding the adoption and development growth of the analyzed object	1 = Divestment 2 = Maintenance 3 = Incremental 4 = Sustained 5 = Massive
Access to specialized knowledge	Current level of accessibility to formative opportunities to build and consolidate the skills and capabilities needed to master the command of the analyzed object	1 = None 2 = Non-formalized knowledge 3 = Good practices 4 = Formalized knowledge 5 = Diffused
Business model knowledge	Level of already existing competences needed to properly manage the analyzed object	1 = None 2 = Non-formalized knowledge 3 = Good practices 4 = Formalized knowledge 5 = Diffused

IV. *Access to specialized knowledge*: Measures the ease of access to formative opportunities to build and consolidate the skills and capabilities needed to master the technology. As for the previous variables, this also partially refers to one presented in the Distance section: skills and knowledge. However, while the latter measures the level of skills currently present in the company, the former indicates how easy it is to fill any gaps in such knowledge, in terms of both referring to the job market or to training courses offered by higher education entities (such as universities and research centers).
V. *Business model knowledge*: Measures how much is known about the business models potentially enabled by the technological object. The indicator estimates

how easy it is to acquire the knowledge and skills to set up such business models and/or adapt them to existing ones.

The color of the icon represents the Speed of a given technology in approaching (or receding from) the center of the HIT Radar, moving across the rings. In other words, it expresses the amount of change that surrounds a given technology solution. As for Impact, the Speed dimension is also evaluated on a five-point scale:

- *Very Slow (red)*: An advancement of this technology towards an inner sector of the radar is not expected to happen in the next 5 years.
- *Slow (orange)*: An advancement of this technology towards an inner sector of the radar is expected to happen in 3 to 5 years.
- *Moderate (yellow)*: An advancement of this technology towards an inner sector of the radar is expected to happen in 2–3 years.
- *Fast (light green)*: An advancement of this technology towards an inner sector of the radar is expected to happen in 1–2 years.
- *Very Fast (dark green)*: An advancement of this technology towards an inner sector of the radar is expected to happen in 6 months/1 year.

Once a final vote has been assigned to each of the three variables, the analyzed technological object is positioned on the radar; the sum of all the technological objects gives life to the actual HIT Radar. Below, it is possible to observe, as an example, the latest available edition of the DEVO Lab HIT Radar (Fig. 5).

7 The HIT Radar Methodology and the DEVO Lab HIT Radar

An important clarification to make in relation to the DEVO Lab HIT Radar presented above is that the four-step process followed by the DEVO Lab is structured in a specific way: as already mentioned in the taxonomy paragraph, it is focused on the cluster and technology taxonomic layers, and based a holistic market perspective.

This implies that companies with different backgrounds and contexts may approach this version of the HIT Radar with skepticism, being further behind or further ahead in the development of one or more of the technologies on display.

However, the version created by the DEVO serves precisely to photograph a situation as generally as possible, considering the technological landscape as perceived by an "average" large company (in the specific case of the DEVO, with further reference to the Italian market), and excluding outliers such as digital champions or laggards.

This does not mean that the radar is unusable for such companies, on the contrary: the primary purpose of the HIT Radar is not to provide an exhaustive overview of all the high impact technologies on the market (i.e., the purpose of the HIT Radar realized by the DEVO Lab). Rather, the purpose of the HIT Radar is to provide a methodologically clear and precise tool through which organizations can assess the technological objects that are most interesting to them.

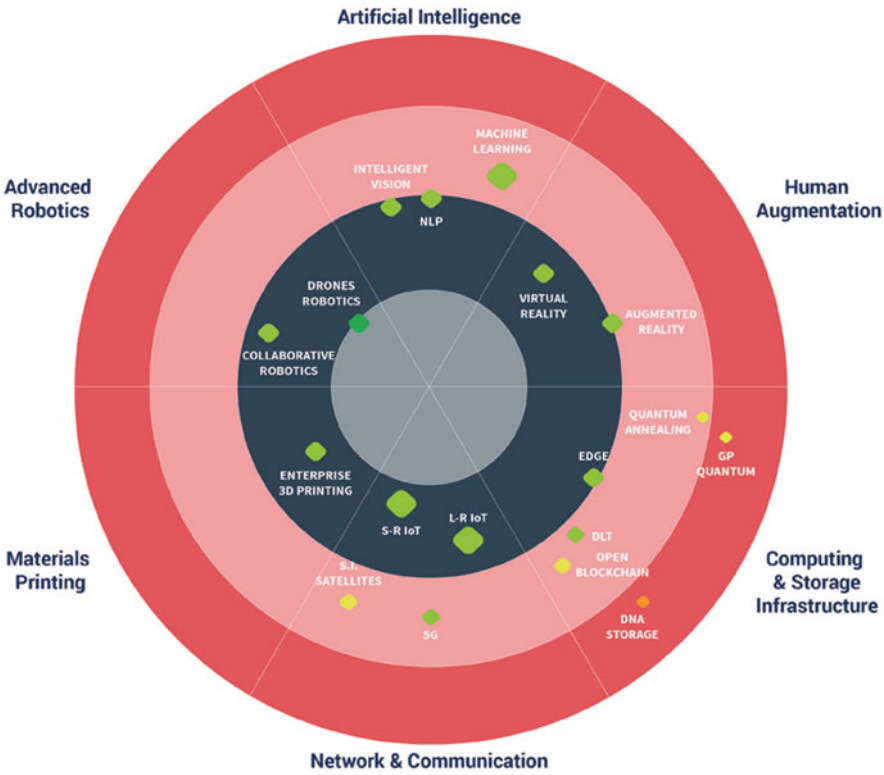

Fig. 5 The DEVO Lab HIT Radar, HIT Radar seventh edition (2020)

This means that, once the four steps outlined above have been assimilated, each organization is encouraged to create its own edition of the HIT Radar, which could also differ considerably from that created by the DEVO Lab. The focus could, for example, be centered on layer 4, related to technological applications; in other cases, it could be worth turning off one of the indicators described in the previous paragraph (i.e., ignoring it for the purposes of the calculation of the final dimension vote). For example, in the creation of the DEVO Lab HIT Radar, we do not take into consideration the "Business model coherence" and "Business model knowledge" indicators that influence Distance and Speed, respectively, precisely because these indicators make sense only when analyzed from the point of view of a specific organization, or at least of a specific industrial sector.

8 The Multiple Uses of the HIT Radar

This possibility of customization is what makes the HIT Radar an extremely versatile and applicable tool that can be applied to the whole technological landscape. In this sense, the HIT Radar makes it possible to respond comprehensively to different

objectives proposed by the Control Objectives for Information and related Technology (COBIT), the reference framework for the management of Information and Communication Technology created in 1992 by the American Association of Information Systems Auditors (ISACA). In particular, the HIT Radar makes it possible to effectively respond to two of the key design factors exposed by ISACA (2019); these elements are the *enterprise goals*, factors that can influence the design of an enterprise's governance system and help in fulfilling the enterprise strategy, and the *technology adoption strategy*.

With particular reference to the enterprise goals (EG), the HIT Radar helps to respond to the need of:

- EG1 (Portfolio of competitive products and services)
- EG3 (Compliance with external laws and regulations)
- EG5 (Customer-oriented service culture)
- EG10 (Staff skills, motivation, and productivity)
- EG12 (Managed digital transformation programs)
- EG13 (Product and business innovation)

To understand in more detail how the HIT Radar facilitates each of these processes, it is necessary to go down one step in the COBIT cascade process and to analyze in detail the Alignment Goals (AG), those that emphasize the alignment of all IT efforts with business objectives. The Alignment Goals to which the indicators analyzed in the HIT Radar allow us to respond more clearly are as follows:

- AG01: I & T compliance and support for business compliance with external laws and regulations (aligned with the "Legal and regulation" and "Legal and regulation evolution" indicators).
- AG03: Realized benefits from IT-enabled investments and services portfolio (aligned with the "Financial compatibility" and "Economic impact" indicators).
- AG06: Agility to turn business requirements into operational solutions (aligned with all the indicators related to the Distance dimension).
- AG08: Enabling and supporting business processes by integrating applications and technology (aligned with the "Business model coherence" and "Business model knowledge" indicators).
- AG12: Competent and motivated staff with mutual understanding of technology and business (aligned with the "Skills and knowledge" and "Access to specialized knowledge" indicators).
- AG13: Knowledge, expertise, and initiatives for business innovation (aligned to all the three dimensions of the HIT Radar).

The HIT Radar should therefore be considered not only as yet another report pre-compiled by market analysts, but rather as a tool helpful in aligning the corporate digital vision and its digital strategy formalization. In this sense, the HIT Radar can be very well integrated with complementary tools such as the COBIT.

9 Conclusions

This chapter clarified an understanding of the needs that led to the birth of the HIT Radar, the rationale behind its creation process, and the customization possibilities offered by the tool. However, it is possible that for many readers this resulted in too theoretical a discussion without any practical implications. This is why the next chapter will aim to present some cases of overhyped technologies examined by the DEVO Lab in recent years, and how interpreting them through the logic of the HIT Radar enabled a better identification of their flaws and real potential.

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The Hit Radar in Action

Leonardo Maria De Rossi

Abstract

In this chapter, we apply the HIT Radar to identify the limitations and actual potential of three high-impact technologies: blockchain, 5G, and drones. The application of the HIT Radar to evaluate blockchain highlights that this technology is not as disruptive as it is often celebrated due to some technical, business, and regulatory limitations. Next, we show that 5G is still far away enterprise adoption, mainly due to marginal organization impact, high deployment costs, and limited technical advancements. Finally, the chapter examines another technological object, drones, and concludes that in 2021 it is possible to consider drone technology ready for enterprise adoption—even if the technology is still far from being perfect and some issues need to be taken in consideration.

As described extensively in chapter "A Tool for the Boardroom: The Devo Lab Hit Radar", the DEVO Lab HIT Radar is a tool to evaluate the impact, ecosystems, and dynamics of digital technology solutions for mid- to large-sized enterprises. The HIT Radar makes it possible to appreciate both the distance of digital technologies from becoming available in mature business applications, their speed in approaching this objective, and their potential impact in the short-medium term.

Since 2016, the year in which the HIT Radar was first presented to the public, it has been used by several academics, researchers, and executives as a foundational tool to design and implement digital strategies. More precisely, it has been used in three main ways: as a scouting tool, as a taxonomy framework, and as an evaluation tool.

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First of all, the HIT Radar has been used to attain a full awareness of the state of the art of emerging technologies and technology trends. Thanks to an extensive and a multidisciplinary scouting, the HIT Radar represents a good starting point for any executive interested in the digital world. Moreover, the inner cross-industry nature of the scouting provided by the DEVO Lab represents an unusual opportunity for innovation. As demonstrated by Poetz, Frank, and Schreier (*Harvard Business Review*, 2014), there's great power in bringing together technological trends in fields that are different from one another yet that are analogous on a deep structural level, such as inventory management and robotics, or malls and mines. Bringing in ideas from analogous fields might turn out to be a potential source of radical innovation. Keeping stuck to the same industry can be very limiting. If executives are interested in studying emerging technological trends and they have the chance to analyze insights from analogous areas, it is likely they will have opportunity for greater novelty in the proposed solutions for two reasons: researchers versed in analogous fields draw on different pools of knowledge, and they're not mentally constrained by existing "known" solutions to the problem in the target field. The greater the distance between the problem and the analogous field, the greater the novelty of the solutions. There are some great examples in industry of creative solutions that have arisen out of analogous fields. More than a decade ago, 3 M developed a breakthrough concept for preventing infections associated with surgery after getting input from a theatrical-makeup specialist who was knowledgeable about preventing facial skin infections.

Second, the HIT Radar has been used as a taxonomy framework. Once all the possible information have been gathered, it is necessary to clearly understand the nature and meaning of each "object" identified in the scouting phase. In fact, there is a risk in merging together different sources: they tend to treat elements that belonged to very different domains of the technology universe in an undifferentiated manner. More precisely, executives are facing a mix of general-purpose technologies (e.g., wearables), technology concepts (e.g., digital dexterity), applications of technologies (e.g., bioacoustics sensing), and general macro-trends (e.g., gamification). As described in chapter "A Tool for the Boardroom: The Devo Lab Hit Radar", the HIT Radar can be used as a taxonomy tool to collocate each one of the elements identified into a five-layer scheme composed of Building Block (Layer 1), Technologies (Layer 2), Cluster (Layer 3),[1] Applications (Layer 4), and Technological Trend (Layer 5). The multi-layer approach provided by the taxonomy represents a significant contribution of the HIT Radar to the research field, as it allows us to at least partially clarify the complexity embedded in the digital transformation domain. Indeed, the taxonomy represents the foundation for a technology glossary that could enable a clear and precise hierarchization and ordering of technological objects, concepts, and trends.

Finally, the HIT Radar has been used as an evaluation framework. The assessment variables at HIT Radar's basis provide a comprehensive overview that includes

[1] As explained in chapter "A Tool for the Boardroom: The Devo Lab Hit Radar", the Cluster layer is an aggregation layer rather than a distinct one.

technical, business, and legal variables. During recent years, this assessment scheme has been applied many times and has allowed executives to gain a clear understanding of some complex technologies. The most relevant example that we can use to testify to the HIT Radar's methodological efficacy is the version realized by the DEVO Lab: the DEVO Lab HIT Radar.

In the next two paragraphs, we will show how applying the HIT Radar framework allowed us to identify the flaws and real potential of some high-impact technologies, in particular blockchain, 5G, and drones.

1 Blockchain Is Less Disruptive Than the Hype

A blockchain is a sequence of blocks, each one containing a certain amount of information distributed through a chain (i.e., a ledger) over a network. It represents a new way of transferring information between two users, without having to go through a central body that certifies their validity.

During 2017, the word "blockchain" was on everyone's lips. With the value of Bitcoin rising to over $2000 and the proliferation of a thousand and more cryptocurrencies that registered a +100% increase in value daily, it seemed that the time had finally come for technology to shine (or as specialized forums in the Internet used to say: "Time to go to the moon!"). Various organizations, market analysts, and newspapers had very high hopes for the technology. In February 2017, the European Parliament published an article entitled "How blockchain technology could change our lives." In September, *Fortune* headlined, "Blockchain Mania! How this revolutionary technology is transforming business." Three months later, the *Forbes* headline read similarly: "What is blockchain and how it will change the world?"

Exactly 11 days later, *Forbes* published an article entitled "The Great Bitcoin Scam." In previous months, despite the success of the technology directly connected to it, the rumors about Bitcoin had already been unceasingly and mainly negative. JP Morgan CEO Jamie Dimon claimed Bitcoin was a fraud, and famed economist Nouriel Roubini claimed it was a giant speculative bubble.

Yet almost 4 years later, the landscape is very different from how it was supposed to be at the time. Most of the projects that promised to revolutionize all sectors from finance to energy have disappeared, while Bitcoin is still alive and has broken the $60,000 threshold in 2021. In the next paragraph, we will show how applying the HIT Radar evaluation scheme allowed us to debunk the hype around this technology.

Indicator	Evaluation scale
Technology maturity	3 = Early availability
Infrastructure coherence	2 = Unfavorable
Legal and regulation	3 = Neutral
Financial compatibility	4 = High
Skills and knowledge	3 = Practitioner

The first evaluations conducted to analyze blockchain referred to its distance (refer to chapter "A Tool for the Boardroom: The Devo Lab Hit Radar" for specific clarification).

Blockchain, as a form of distributed data storage, is a paradigm that relies on a decentralized, permission-less, censorship-resistant, and uncontrollable network. The network is represented by the sum of all the nodes making use of their computational power to participate in the consensus mechanism—confirming or rejecting new transactions—that also store the whole history of the transactions that have ever occurred in that specific blockchain. In a blockchain, anyone, including malicious actors, can participate in the consensus process. Moreover, anyone can join the network and use the application enabled by the blockchain technology. A user can access a specific service without the authorization of the service provider. There is no central authority, and everyone with an Internet connection can use the final application, read the transaction's history, and eventually participate in the consensus mechanism. It is a completely open ecosystem with no possible control. For all these reasons, companies have always been very skeptical. It is difficult to convince an executive to rely on a technology he can't control by design. For this reason, blockchain had an "unfavorable" infrastructure coherence.

The technical barriers were not over. Blockchains—like Bitcoin or Ethereum—have some inner technical characteristics which make them poorly flexible and dynamic at their core level. In particular, the values that make Bitcoin a popular phenomenon are also those that make developing software atop Bitcoin more challenging than on any other digital infrastructure. Developers are limited to what they're able to transform in order to not undermine its apparatus as a store of value. The reason for this is that the core set of consensus rules that define its monetary properties, such as its algorithmic inflation and hard-coded supply, must remain unchanged.

Nonetheless, since 2009, open blockchain ecosystems have attracted developers to improve and revamp most of its underlying codebase. Since changing blockchain's core layer (also called "layer 1") requires a quasi-political process that may go against its monetary properties, innovative tools (such as the so-called layer 2) are often implemented on top of it. This development is similar to that of the Internet's protocol suite, where layers of different protocols specialize in specific functions. Emails are handled by SMTP, files by FTP, web pages by HTTP, user addressing by IP, and packet routing by TCP. Each of these protocols has evolved over time to create the experience we have today. In 2020, blockchains at layer 1 were still immature, especially in terms of scalability and privacy. Developers were working to make blockchains private and scalable at layer 2. For example, Bitcoin's most prominent and discussed layer 2 module is called "Lightning Network," which (in theory) would enable instant micro-payments, free transactions, enhanced privacy, and smart-contracts support. Yet, it was still in its early stages, requiring years of testing and improvement before massive adoption. Ethereum was working in the same way: Raiden Network is an off-chain scaling solution on layer 2, enabling near-instant, low-fee, and scalable payments. As for Bitcoin, Ethereum's layer 2 solutions

were not ready yet. Keeping that in mind, it was possible to consider blockchain with a medium level of technical maturity (i.e., early availability).

Lawmakers and regulators of several countries were paying more and more attention to the rise of blockchain and distributed ledger technologies in general and for particular applications of these technologies in specific sectors. It is worth noting that such a distributed and decentralized technology may raise, prima facie, a variety of concerns from a legal standpoint. However, it is necessary to look at specific implementations to properly assess the critical issues behind the varying "settings" (private, public, permission-less, permissioned) of the blockchain technologies.

Since blockchain nodes may be located in different states, this technology has the ability to cross jurisdictional borders. This distinguishing feature, which is common to the Internet, may cause difficulties when it comes to determining the governing law of blockchain-based activities, as every transaction is potentially subject to the law of every state where relevant nodes are located. In addition, regulatory differences may significantly affect transactions and activities, and complying with every piece of legislation to which transactions are potentially subject may prove much too burdensome.

Also, it is often debated whether blockchain-based transactions may comply with "General Data Protection Regulation" (GDPR) requirements. If personal data (most notably, transactional data) are stored in blocks, the relevant processing activities are subject to the GDPR, even if the data are encrypted, since encryption is a pseudonymization technique but not an anonymization technique (as it does not irreversibly prevent identification). Therefore, even if personal data are encrypted when stored on blocks, they still amount to "personal data" (i.e., any information concerning an identified or identifiable person) and are subject to the relevant legislation on data protection. Then, if data are not left off-chain, and the GDPR applies, other issues may arise, most notably because of the decentralized nature of blockchain protocols and the inherent immutability of the relevant activities.

Among others, Article 5 of the GDPR establishes principles such as data minimization and purpose limitation. It might however be difficult to comply with these principles in the specific domain of blockchain protocols because once data are stored on blocks, they are constantly processed and cannot be subject to proper removal. Also, under the GDPR, data subjects have some rights vis-à-vis the controller that may be difficult to enforce, such as the right to rectification, the right to portability, and the right to erasure. Another debated point concerns the identification of the data controller, the natural or legal person who determines the means and purposes of the processing of personal data. However, these issues may come into play at a different degree depending on the type of blockchain implemented: permission-less and public blockchains seem to be more difficult to reconcile with the data governance scheme behind the GDPR, while private blockchains and permissioned (public and private) blockchains are less critical in this respect.

Legal issues also concern smart contracts, which are contracts subject to automatic execution upon previously specified conditions which are subject to coding.

However, not every contractual provision may be subject to coding, allowing for automatic execution. Another important limitation derives from the fact that it could be difficult to ascertain whether the criteria upon which the contract must be executed are actually met. This is the reason why smart contracts are not per se considered binding agreements but rather forms for electronically executing already-existing transactions. All these reasons suggested that legal aspects were neutrally affecting blockchain's adoption.

One of the most crucial aspects that has negatively impacted blockchain's adoption has always been the skills and knowledge around it. Blockchain was mostly misunderstood by most of the executives still blinded by the hype effect around this technology. Nevertheless, an increasing number of universities across the world were offering blockchain courses, to meet the growing demand for blockchain skills.

A company interested in this technology could exploit a freely available software solution based on a freely available blockchain environment. No real developments were required, and the entire blockchain architecture could actually be outsourced. More precisely, a company can decide to exploit an already existing network—such as Bitcoin or Ethereum. In this case, the company was not creating a new software application, rather it was just adopting an available service. Thus, no relevant financial investments were required. For example, Intesa Sanpaolo, an Italian banking group, prototyped a software solution using the Bitcoin blockchain to notarize financial data and make them available for third parties' investigations. Intesa Sanpaolo held the databases where all the trading records were saved daily and forwarded them via an external timestamp provider (Opentimestamp) to the Bitcoin blockchain. Thanks to this solution, Intesa Sanpaolo could guarantee to an external auditor the immutability of its trading records. In order to verify that the information has not been tampered with, the auditor can independently check the timestamp recorded in the Bitcoin blockchain. Thanks to its open and free nature, blockchain has a very high level of financial compatibility.

The previous analysis clearly shows the rigorous approach to evaluating the distance of a technology to its adoption. Only by analyzing all the difference technical, business, legal, and infrastructural aspects it is possible to establish whether a technology should be adopted or not. In this particular case, the HIT Radar demonstrated how blockchain was very far from being ready for adoption.

Indicator	Evaluation scale
Economic impact	2 = Marginal
Organizational impact	1 = None
Accountability	2 = Marginal

The second dimension evaluated with the HIT Radar relates to the impact that the specific technology is having within the business world.

Despite all the rumors, blockchain adoption was extremely limited. Actually, very few companies were relying on blockchain. The main reasons had already been anticipated and were strictly related to the uncontrollable nature of the technology.

Thus, it was not a matter of "what companies could do with open blockchain," but rather a matter of "how can companies manage fully decentralized applications."

On one side, some companies were trying to turn around this problem by developing closed software solutions on an open blockchain environment. In this case, data were freely available to everyone, but the final users could access the actual service only if the provider allowed them to. Thus, a company didn't have to create its own blockchain ledger, nor to dedicate a proprietary hardware infrastructure to create a blockchain-based service.

On the other side, other companies were trying to exploit fully decentralized ecosystems with no control over the final applications. Clearly, they could benefit from marginal costs and limited skills required to access this technology. As anticipated in the previous paragraph, Intesa Sanpaolo tested a fully decentralized application. Thanks to this solution, Intesa Sanpaolo can guarantee to an external auditor the immutability of its trading records. In order to verify that the information has not been tampered with, the auditor can independently check the timestamp recorded in the Bitcoin blockchain.

These considerations led us to think that the actual impact of blockchain was still very limited. This conclusion was totally in contrast to the actual hype around this technology.

Indicator	Evaluation scale
Infrastructure trends	3 = Incremental
Legal and regulation evolution	4 = Ongoing reform
Level of market investments	3 = Incremental
Access to specialized knowledge	3 = Good practices

The last dimension of the HIT Radar evaluation scheme is the dynamism—i.e., an indicator of the possible evolution of that technology. As of February 2021, the total market value of blockchain was worth about $1.5 trillion. Bitcoin covered more than half of the entire market, and hit a value of 48,000 USD per bitcoin in February 2020. Decentralization was a big thing in the market.

Research by the Everest Group found that more than 50% of the investments in technology in organizations occurs outside the IT department. This decentralization trend created some concerns in chief information officers and compliance officers due to security and compliance risks, but it was still one of the most discussed topics on their agenda.

Decentralized finance (DEFI) was one of the most exciting trends enabled by blockchain. DEFI consists in the systematic reinvention of traditional financial products; insurance, loans, and exchanges are all being reimagined in a decentralized way. Another relevant trend was the huge number of Internet-connected devices. Such devices needed a secure and reliable way of communicating with each other, and blockchain could have become the core technology for the future of IoT.

Other applications revolved around decentralized certification, decentralized identity, and decentralized governance, just to name a few.

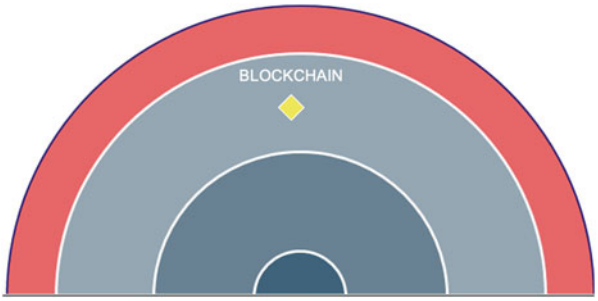

Fig. 1 HIT Radar—Blockchain evaluation—Year 2020

Finally, it is important to mention that Gartner listed blockchain as one of the top ten strategic technologies for 2020. While blockchains were considered to be too immature for enterprise deployment due to poor scalability and interoperability, Gartner expected the technology to overcome these issues by 2023. Until then, the industry would see several changes with many advancements in technology but also mistakes and errors in its implementation. Thus, the overall trend was positive.

Dimension	Evaluation
Distance	Explore
Impact	Low
Speed	Moderate

Below, it is possible to find the final result of the assessment of Blockchain (Fig. 1).

The example of blockchain is a clear demonstration of the potential application of the HIT Radar. By analyzing this technology in all its different facets, it emerged that Blockchain was not as disruptive as many tech analysts were claiming. On the contrary, it seemed like it was still in its early stages. Governance uncertainties, legal doubts, and enterprise recognition were still heavily limiting its adoption. Nevertheless, investments were really high, universities were spreading specific knowledge, and there was a real demand for decentralized infrastructure.

2 5G Is Still Far From Enterprise Adoption

5G is the fifth-generation cellular network technology that provides broadband access, following its predecessors 1G, 2G, 3G, and 4G and their respective associated technologies (such as NMT, GSM, UMTS, and LTE).

Like blockchain, 5G has also been one of the most hyped technologies on the market for the past few years. Although it was clearer from the beginning that 5G would have needed time to take off, due to the effort both in economic and resource terms to build its infrastructure, this has not prevented the rumors about its potential to go wild. In 2016, 3 years before the first commercial 5G antenna was even activated, the World Economic Forum published an article titled “How will 5G

internet change the world?" without even wondering if it *would* change the world. A few months earlier, at the Mobile World Congress, *The Economist* had described the technology as being able to offer users "no less than the perception of infinite capacity." At the end of 2018, a few months before the official launch of their first 5G chipset, the American company Qualcomm simply said that with 5G "your life is going to change."

Now, while 5G certainly has the potential to bring about significant changes in our daily lives, it is hard to believe that this will happen overnight, as these titles seem to suggest. And in fact, on a technical level, it will actually be impossible to realize most of the promises of 5G before 2025.

With the help of the HIT Radar framework, we will see again which of the technology applications it will be really possible to enable in the short-medium term.

Indicator	Evaluation scale
Technology maturity	3 = Early availability
Infrastructure coherence	3 = Neutral
Legal and regulation	4 = Enabling
Financial compatibility	2 = Low
Skills and knowledge	2 = Basic

After having arrived on the market almost a year ahead of expectations, 5G technology continued in 2020 on its path towards maturity and wider market diffusion. In 2020, around 90 telecommunications operators globally offered some type of 5G service, with around 40 countries covered.

On a purely technical level, however, progress were still limited: 5G technology was only available in a non-standalone format, with parts of the infrastructure that relied on the pre-existing 4G architecture and were therefore unable to guarantee all the promised features of the technology (particularly ultra-low latency and massive machine-to-machine communication). Furthermore, the diffusion of the technology at country level remained very expensive.

On the contrary, in 2020 significant advancements on the consumer side of the market were registered, with the arrival on the market of 5G-enabled devices released by most of the largest manufacturers worldwide. In this specific market niche, however, there was another major chip manufacturer, Qualcomm, which had confirmed its position as the top player, the only one to have already designed its third generation of 5G chips.

Indicator	Evaluation scale
Economic impact	3 = Moderate
Organizational impact	2 = Marginal
Accountability	3 = Moderate

Despite the advances from a consumer point of view, 5G remained a technology still a bit far from the enterprise world. This reason was that despite the undeniable potential uses of 5G technology in many fields (from self-driving cars to

telemedicine), the insufficient technical maturity prevented the realization of the most innovative use cases. Of 90 telco operators, about three-quarters were providing Enhanced Mobile Broadband (eMBB) services, the natural evolution of the broadband services introduced with the progressive development of 4G technology. In most cases, eMBB coincided with improved performance related to video/audio streaming, download, and upload, with connections that can theoretically reach 2Gbps today—a twofold improvement compared to faster consumer optical fiber. Forty operators were also offering Fixed Wireless Access services, while about a dozen were providing ultra-low latency (uRLLC) and massive machine-to-machine communication (mMTC) services. Nevertheless, these were mostly experiments or pilot projects and not already operational applications.

For massive adoption at the enterprise level, however, the effects of 5G needed to be tangible enough to justify the investment: the results that could have been obtained with the first 5G networks were simply too close to those that can be achieved with the more mature 4G infrastructure. This had pushed the manufacturers to delay the production of enterprise devices by about a year compared to consumer devices (as happened with 4G years ago). Over 50 companies operating globally declared that they were active in the production of devices for the enterprise world. However, only 26 of these had started to commercialize their products.

In terms of economic and organizational impacts, therefore, it was very difficult to determine what the consequences of the adoption of 5G would have been, although, especially with regard to the latter, one could have expected that the situation would not be too dissimilar to that already existing today with regard to 4G services. In this sense, two considerations could have been made. The first is that companies that wanted to make use of this technology needed to start thinking about DevOps units with quite an ample set of skills, particularly those related to automation and orchestration, and to make sure they operate with a "cloud native" mindset, to make the most of the opportunities actually offered by technology when they will be mature. The second was to start preparing from a security point of view, as 5G would potentially connect thousands of devices, and it would be essential to guarantee the robustness of the network and its security with respect to possible infiltrations.

Indicator	Evaluation scale
Infrastructure trends	4 = Sustained
Legal and regulation evolution	5 = Ready for approval
Level of market investments	4 = Sustained
Access to specialized knowledge	3 = Good Practices

The level of market investments related to 5G grew a lot over these years, with several market research companies quantifying the growth at a very high CAGR ranging between 25 and 30% for the period between 2020 and 2025. This growth was also motivated by the fact that 2020 was the year in which many telecommunications operators had begun to develop the first infrastructural elements related to standalone 5G, a trend that will only increase in the years to come.

However, infrastructure development costs remained high, and this could have led to a coexistence period between 4G and 5G much longer than that observed between 3G and 4G. The infrastructure market was also proving to be very interesting, even for players traditionally far from the telco focus: Companies with a more generalist focus, for example, big IT players such as Cisco, HPE, Microsoft, Lenovo, Dell EMC, and Oracle are all engaging in the sale of hardware for the 5G core network. The reason was that the 5G core network, i.e., the set of data centers and servers that physically make up the 5G network, had been redesigned compared to the 4G network to include a greater number of distributed servers to improve the overall network latency. Such companies could therefore establish themselves in this technology thanks to their expertise in the production of edge computing modules. Not only that: many of the skills required in the development of the 5G infrastructure, including for example, the aforementioned cloud native mindset, or the ability to manage open source software, or the management of platforms based on API, have been being acquired for years by the incumbents just mentioned, which therefore enjoy a position of further advantage, given this synergy.

In any case, what was appearing certain was that the development of 5G infrastructures was proceeding at full speed: in the United States, 5G coverage has gone from 30 to more than 100 cities in 1 year; in China from 0 to more than 50; in South Korea, the rollout of the NSA network at national level is almost complete and work is underway for the development of the SA network. And with the arrival of small cells, i.e., antennas capable of communicating at microwave level and effectively realizing the promises of applications based on the uRLLC and mMTC characteristics of the network, the infrastructural development trend was destined to undergo further acceleration, already starting in the next few years.

From a legal point of view, European institutions have paid significant attention to the developments concerning 5G in the sphere of electronic communication services and networks. In 2013, the European Commission signed an agreement with the "5G Infrastructure Association," representing major industry players. The goal of this agreement was to set up a Public Private Partnership on 5G (so-called 5G PPP) aimed at fostering research developments in 5G technology. The Security Working Group of the 5G PPP project published a white paper in July 2017 that highlighted the need to revisit current network security approaches in light of the emergence of 5G. Also, in its report delivered in March 2018, ENISA pointed out that early generations of mobile networks rely on a set of protocols designed decades ago and several threats and attacks are likely to occur in light of that and in the absence of appropriate safeguards. Organizations wishing to implement 5G-based technologies have therefore to take data security and data protection seriously from a legal standpoint, e.g., by adopting the necessary organizational and technical measures in accordance with the NIS Directive (Directive on security of network and information systems) and the GDPR.

The European Commission's 5G Action Plan aims to provide 5G services in all Member States by the end of 2020, as well as ensure 5G coverage in urban areas and along main transport paths by 2025. The European Union has also recently adopted the European Electronic Communications Code (Directive 2018/1972), which has

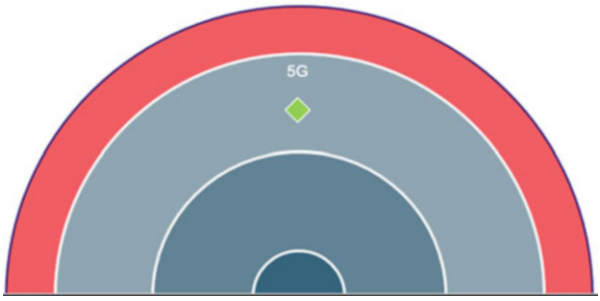

Fig. 2 HIT Radar—5G final evaluation

gathered the existing pieces of legislation for electronic communications networks and services.

As to the most recent legislative stances, it is worth noting that in light of such a goal, Article 54 of the European Electronic Communications Code (Directive 2018/1972) requires Member States, for terrestrial systems capable of providing wireless broadband services, to facilitate the roll-out of 5G and to take the appropriate measures to (a) reorganize and allow the use of sufficiently large blocks of the 3.4–3.8 GHz band; (b) allow the use of at least 1 GHz of the 24.25–27.5 GHz band, provided that there is clear evidence of market demand and of the absence of significant constraints for migration of existing users or band clearance.

Dimension	Evaluation
Distance	Explore
Impact	Low
Speed	Fast

Below, it is possible to find the final result of the assessment of 5G technology (Fig. 2).

Despite being increasingly cited, 5G was still far from the revolutionary technology that many talked about. Of the three macro-categories of applications enabled by 5G (eMBB, uRLLC, mMTC), only the eMBB applications were enabled by the 2020 infrastructure (and also in this case, only in the most urbanized areas where 5G has already been released). But the eMBB applications were also the least revolutionary, a simple enhancement of those services already offered today through the 4G network. This was not an underestimation of the technology, which maintains its great potential, as demonstrated by the growing level of public and private investments.

3 Drones Are Ready for Enterprise Adoption

Generally, the term “drone” is usually associated with the concept of a flying vehicle with four rotors that is remotely controlled by a user. Unfortunately, that is an oversimplification, which masks the wide range in shapes, sizes, and capabilities

that characterize today's drones. Basically, it is possible to identify four major types of drones: Unmanned Ground Vehicles (UGV), vehicles that operate in direct contact with the ground and without an onboard human presence; Unmanned Aerial Vehicles (UAV), aircrafts that navigate without a pilot onboard; Unmanned Underwater Vehicles (UUV), vehicles that are able to operate underwater without a human occupant; and Unmanned Surface Vehicles (USV), vehicles that operate on the surface of the water (watercraft) without a crew.

Each one of these types of drones can be either remotely controlled (as for RPAV—Remotely Piloted Aerial Vehicles) or can operate autonomously. From the regulatory perspective, this book uses the term "Drones" to refer only to "Remotely Piloted Aerial Vehicles" because this is the only type of drone that is specifically regulated by the Italian regulatory system. Finally, drones are usually associated with battery-powered vehicles. Yet, it is possible to identify many types of drones powered by other energy sources, such as solar power, combustibles, laser, or simply tethered with a cable to a power supply.

After this clarification, it is possible to define a drone as a vehicle that can be remotely controlled by a user or can autonomously work based on pre-programmed plans or more complex dynamic automation systems, which are usually built with stabilization sensors, advanced software systems, and other equipment (e.g., GPS, cameras, First Person Viewing).

Indicator	Evaluation scale
Technology maturity	5 = Mature
Infrastructure coherence	3 = Neutral
Legal and regulation	4 = Enabling
Financial compatibility	4 = High
Skills and knowledge	5 = Master

2019 was a watershed year in the autonomous drone industry, and there's every indication that 2021 and beyond will see further technological advancement, wider adoption, and more powerful analysis capabilities.

From a technical point of view, drones can finally be considered ready for adoption. Even if drones are far from being a perfect technology—like most of the technologies we use every day—multiple advancements have been made in recent years. Today's drones have advanced sensors able to calculate external distance measurements and to detect external formations to avoid collisions. The power supply now ranges from lithium-polymer batteries to standard airplane engines. They also possess very advanced software suites in the form of a flight stack consisting of firmware, middleware, and an operating system that manages flight control, navigation, and decision-making. There are still many potential enhancements that will be explored in the next few years, but the overall maturity is high enough for general adoption. Such improvements include hydrogen-powered drones, improved computer vision, environmental awareness, and autonomous recharging.

The physical infrastructures used by a drone are (a) the field, intended as the surface where the drone operates, and (b) the network for transmitting/receiving data, intended as the networks drones use to be radio-piloted and transmit data. In both cases, we do not observe any relevant limitations that could affect drones' adoption.

Recent developments have occurred in the specific field of unmanned aircraft systems in EU law. In 2019, the European Commission adopted a set of rules aimed at ensuring that the increasing drone traffic across Member States is safe and secure for people on the ground and in the air. These rules are provided by the Commission Delegated Regulation (EU) 2019/945 of March 12, 2019, on unmanned aircraft systems and on third-country operators of unmanned aircraft systems and by the Commission Implementing Regulation (EU) 2019/947 of May 24, 2019, on the rules and procedures for the operation of unmanned aircraft. These provisions apply to both professional and non-professional operators of drones and will replace domestic rules adopted by Member States. The goals of ensuring safety and reducing security risks are achieved through the implementation of mechanisms such as operators' registration with national authorities, remote identification, and identification of geographical zones.

The new rules apply to all drones regardless of weight, although stricter requirements must be met by operators of drones weighing more than 25 kg. The use of drones and drone robotics must in any case comply with other sectorial requirements (if any), such as data protection. Also, scholars are still debating whether special rules should be implemented concerning liability for damages occurring as a consequence of the use of drones and drone robotics: the allocation of civil liability and the relevant "costs" constitutes a key factor to ensure legal certainty in this industry and to promote the adoption of common "best practices" from manufacturers and/or users. Besides, concerns from privacy and data protection standpoints may emerge to the extent these technologies are implemented in order to process personal data (e.g., by implementing recording features). Among others, the Spanish Data Protection Authority (AEPD) has released guidelines on "Drones and Data Protection."

A critical variable, which had a major impact on drones' adoption in recent years, was the skill level required to use this technology. This does not represent a problem anymore. A company interested in using drone technology can decide either to train some employees or to rely on professional authorized services. In both cases, that company could refer to several service providers (especially for aerial video services) or multiple training courses authorized by the national aviation authorities.

Indicator	Evaluation scale
Economic impact	3 = Moderate
Organizational impact	2 = Marginal
Accountability	3 = Moderate

In Italy, it is possible to count more than 700 companies active in the drone industry. Over 650 companies have requested drone authorization to ENAC, and in

the last 3 years more than 13,000 drones have been registered with the Italian Civil Aviation Authority.

With widespread access, consumer companies such as Amazon have explored the use of unmanned aerial vehicles for commercial purposes. Amazon Prime Air has promised a 30-minute delivery service for packages of up to 5lbs. Google, in contrast to Amazon, has developed aerial drones for environmental conservation and the delivery of medicine to remote locations.

A few early adopters approached drones with vigor some years ago. As it was outlined in the article "We're About To See The Golden Age Of Drone Delivery—Here's Why" in the Financial times "Rwanda saw the opportunity to save lives and prevent waste in their blood supply chain through drone deliveries, becoming the first country in the world with more drone flights than traditional flights. Switzerland embraced drones years before Italy, realizing benefits at small scale and taking a leadership position in Europe. In Australia, drone delivery of consumer products was tried and tested with mixed results, but significant lessons were learned along the way. Chinese e-commerce leader JD.com has launched multiple projects in cities across rural China, expanding use as soon as COVID-19 hit." These are just a few of the thousands of companies using drones daily in well-known use cases such as fast delivery, monitoring, and exploration.

The economic implications of commercial drone use are undeniable. Besides the consumer market, the most affected sectors are infrastructure and agriculture. Due to the ability to cover large areas, drone use in agriculture is anticipated to effectively feed and hydrate plants while also limiting exposure to diseases. On a macroeconomic scale, the integration of UAVs is expected to create more than 100,000 jobs. Over a 10-year span, job creation from commercial drone use will consist primarily of manufacturing jobs and drone operators. Drone expert Mary Cummings—professor at the MIT and Duke University—declared, "Unless you work as a pilot then it's unlikely that a drone will take over your role anytime soon. In fact, drone technology could lead to the creation of new jobs."

The implications clearly have positive economic and organizational impacts. Consumers directly benefit from job creation, resulting in additional earnings. Enterprise drones will also allow industries to realize savings from cost-effective means of inventory, transportation, and distribution. Companies adopting drones all agree: introducing drone/UAV technology to their firm has found cost savings and improved project scheduling. Moreover, labor/crew hours have readily been absorbed by most firms through increased projects, and other benefits include improved safety, job-site related efficiencies, increased collaboration, and potential new product offerings.

For example, one of the largest aerial solar inspection companies in the world has conducted a study to determine how faster, safer, and more cost-efficient it is to perform drone inspections compared to manual ones. The results of the study demonstrate that drone inspections were 97% faster than manual inspections. Cost savings due to efficiency gains averaged $1254 per MW (range of $1074 to $1717 per MW). From a safety perspective, each site managed to almost completely eliminate hazardous man hours. Moreover, the inspection data collected by drones

matched the data collected manually with 99% accuracy, but the manual inspection took 2 days while the drone inspection only took 2 hours.

Indicator	Evaluation scale
Infrastructure trends	4 = Sustained
Legal and regulation evolution	5 = Ready for approval
Level of market investments	3 = Incremental
Access to specialized knowledge	5 = Diffused knowledge

Like the Internet and GPS before them, drones are evolving beyond their military origin to become powerful business tools. They've already made the leap to the consumer market, and now they're being put to work in enterprise and civil government applications from firefighting to farming.

After years of continuous growing, the drone marketing is still booming. From generating $22.5 billion in 2020, it will grow at a CAGR (Compound Annual Growth Rate) of 13.8% to almost double that in 2025, reaching a total size of 42.8 billion USD in 2025. The energy sector is the largest industry on the commercial drone market in 2020 and will continue to be so in 2025. However, the transportation and warehousing industry will continue to be the fastest growing. This is partly because, as defined by the North American Industry Classification System (NAICS), this vertical includes industries providing transportation of passengers (although air taxis will still not sell for some time) and cargo, warehousing and storage for goods, and support activities related to modes of transportation like inspection and maintenance of infrastructure. While agriculture and construction currently follow energy as the top industries in the drone market, the growth of the transport sector will mean that by 2025 it will be the second-largest industry within the market. After so many years from its debut in the enterprise world, drones are not a mystery object. There are plenty of schools to train pilots, plenty of research, proven use cases, applications, and drone providers. Acquiring know-how on drones today is not a problem.

Finally, it is worth mentioning a specific "pandemic trend." From the initially reported outbreak of coronavirus (COVID-19) in China to its spread across the globe, many companies have been rolling out robots and drones to help fight the pandemic and provide services and care to those quarantined or practicing social distancing. This pandemic has fast-tracked the "testing" of robots and drones in public as officials seek out the most expedient and safe way to grapple with the outbreak and limit contamination and spread of the virus.

Dimension	Evaluation
Distance	Adopt
Impact	Mid
Speed	Very fast

Below, it is possible to find the final result of the assessment of Drones (Fig. 3).

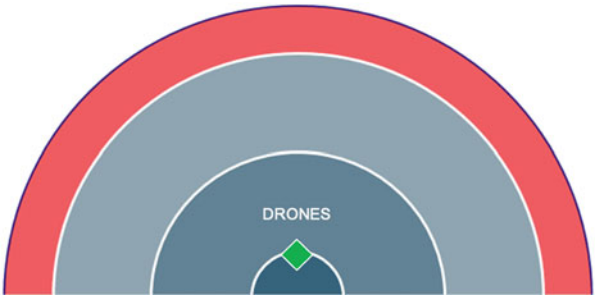

Fig. 3 HIT Radar—Drones evaluation—Year 2020

After many years of continuous hardware and software improvements, enterprise drones are now being used across a wide selection of industry verticals, with construction, insurance, and retail among the biggest users. Their benefits are valuable for companies engaged in monitoring activities and data analysis. From July 2020, the new European drone rules will come into force, providing the needed clarity for the business sector and for drone innovators Europe-wide. Yet, before putting money on the table, executives must identify the internal (authorized) resources accountable and responsible for this technology.

4 Applying the HIT Radar: Final Recap

The two examples cited so far allow us to understand the ultimate purpose of the DEVO Lab HIT Radar much more easily than the previous chapter. Two technologies presented, blockchain and 5G, have been subjected to exaggerated media coverage since their inception. Yet, despite all the hype, most of what these two technologies promised has not been realized (for obvious reasons).

This does not mean that the two technologies have no value, and indeed, it is very likely that in the long run they will prove to be truly "high impact." But this does not facilitate the task of a CIO, who must be ready to seize the technological opportunities in the present and with the right timing to avoid running into painful wastes of time and money.

The HIT Radar analysis framework enables exactly this: analyze the existing technological landscape, catalog the objects that capture the interest of an organization, and position them rationally on a temporal axis that indicates how and when is best to approach them.

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The Legal Side of Digital Technologies: Challenges and New Paradigms

Marco Bassini and Oreste Pollicino

Abstract

The chapter aims to provide an overview of the relationship between law and the rise of digital technologies. It focuses on two of the most challenging issues that have come up in cyberspace, namely, the role of online platforms in the context of content moderation and the protection of personal data. It highlights the role played by courts in safeguarding the rule of law principle also in the digital sphere, in light of the emergence of new "private powers" that more and more are capable of influencing the degree of protection of human rights (such as freedom of expression and the right to privacy).

1 Enforcing the Rule of Law in the Algorithmic Society

New technologies have always challenged, if not disrupted, the social, economic, legal, and to an extent, the ideological *status quo*. The development of data collection, mining, and algorithmic analysis, resulting in predictive profiling, is playing a disruptive role. Society is increasingly digitized, and the way in which values are perceived and interpreted is inevitably shaped by the consolidation of the information society. The pandemic season has not only broadened the technological challenges, as in the case of contact tracing, but it has also shown the role of private actors in acting as essential infrastructures or digital utilities. Facebook, Amazon, and Zoom are just three examples of actors that have allowed people to study, work, and maintain social relationships.

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The rule of law has not been spared in this process of framing (but not transforming) traditional categories in light of technological dynamics.[1] The newness of (algorithmic) technology is a natural challenge for the principles of the rule of law.[2] However, technology also represents an opportunity to foster this principle, since it can provide better systems of enforcement for public policies, as well as a clear and reliable framework to compensate for inefficiencies *de facto* undermining legal certainty.[3]

Within this framework between innovation and risk, the key question to be addressed by regulators is whether algorithmic technologies can encourage the exercise of arbitrary powers.[4] The principle of the rule of law is a precondition for ensuring equal treatment before the law, protecting human rights, preventing abuse of power by public authorities, and holding decision-making bodies to account.[5] The rule of law is primarily considered as the opposite of arbitrary public power. Therefore, it is a constitutional bastion limiting the exercise of authorities outside any constitutional limit and ensuring that these limits answer to a common constitutional scheme. In the information society, this principle is a primary safeguard to ensure that when public actors implement digital technologies to increase their efficiency, provide better services, or improve the performance of public tasks, the exercise of these activities is not discretionary but based on clear and proportionate provisions. At the same time, the lack of expertise of public authorities and the rise of gatekeepers online have led the public sector to increasingly rely on private actors to ensure the enforcement of public policies online.[6]

Nonetheless, in the lack of regulation or horizontal translation of constitutional values, the principle of the rule of law does not limit the freedom that private entities enjoy in performing their activities, including their right to free speech or freedom to conduct business. In a global digital environment, the threats to the principle of the rule of law do not just come from the implementation of algorithmic technologies by public actors, but also, and primarily, from the ability of transnational private actors to develop and enforce private standards that compete with public values. This is evident when focusing on how information flows online and the characteristics of the public sphere, which is increasingly personalized rather than plural.[7] Likewise, the

[1] See Oreste Pollicino and Giovanni De Gregorio, "Constitutional Democracy in the Age of Algorithms: The Implications of Digital Private Powers on the Rule of Law in Times of Pandemics," *MediaLaws.eu,* 11 November 2021.

[2] Monroe E. Price, "The Newness of Technology" (2001) 22 *Cardozo Law Review* 1885.

[3] Steven Malby, "Strengthening The Rule of Law through Technology" (2017) 43 *Commonwealth Law Bulletin* 307.

[4] Mireille Hildebrandt, "The Artificial Intelligence of European Union Law" (2020) 21 *German Law Journal* 74.

[5] Jeremy Waldron, "The Concept and the Rule of Law" (2008) 43(1) *Georgia Law Review* 1.

[6] Michael D. Birnhack and Niva Elkin-Koren, "The Invisible Handshake: The Reemergence of the State in the Digital Environment" (2003) 8 *Virginia Journal of Law & Technology* 1.

[7] Giovanni De Gregorio, "Democratising Content Moderation: A Constitutional Framework" (2020) 36 *Computer Law & Security Law Review* 105374.

field of data is even more compelling, due to the ability of private actors to affect users' rights to privacy and data protection by implementing technologies whose transparency and accountability cannot be ensured.[8]

The technological factor makes an already troubled situation increasingly serious, in which the rule of law seems to be under siege. Within this framework, it is worth wondering what the role of law in the algorithmic society is. How do particular states deal with the emerging private powers that bring new threats to the principle of the rule of law? How should states address the challenges generated by the spread on a larger and larger scale of digital technologies that increasingly play an essential role in a variety of human activities and process large amount of personal data?

Before exploring the most recent stances taken by the European Union regulators, it is worth noting that such a scenario, whereby private powers have arisen and created unprecedented challenges for the protection of a plurality of human rights, finds it roots in the initial desire to maintain their immunity to strict regulation in different respects. The absence of particular constraints that could, in a way, place some restrictions on digital platforms' freedom to conduct business was intended to avoid measures that could undermine the flourishing of services deemed to be of key importance. But if such an approach made sense at the time of the origins of the Internet (when the apparently free-of-charge nature of these services made it possible for the most important platforms to collect large amounts of data), whether the lack of more in-depth regulation is still beneficial overall can now be questioned.

This chapter will try to answer these questions, addressing the two most important pillars when it comes to exploring the relationship between technology and regulation, namely, content and data. Both perspectives provide interesting insights into the current challenges to be dealt with in the algorithmic society and into the role of regulation in preserving protection of fundamental rights against this background.

In the specific domain of the protection of personal data, the digital revolution made it necessary, at the level of the European Union, to shift from a more flexible and open-ended legal framework (namely, Directive 95/46/EC), drafted in the age that preceded the rise of the Internet and its spread on a massive scale, to a more detailed and stricter piece of regulation, which came into force in 2016 (the General Data Protection Regulation). This dynamic clarified the influence of the emerging technologies on the effectiveness of the existing legal measures and brought to light the need to revisit some of the pillars of the legal framework in order to not deprive individuals from the essence of their fundamental rights.

The key question is then, in view of the new challenges surrounding the role of digital platforms, can a similar process take place before it is too late?

[8] Serge Gutwirth and Paul De Hert, "Regulating Profiling in a Democratic Constitutional States," in Mireille Hildebrandt and Serge Gutwirth (eds), *Profiling the European Citizen* 271 (2006).

2 Reforming the Legal Regime Applicable to Internet Service Providers: When Content Regulation Passes Through Services Regulation

The dispute that recently arose between the social network Twitter and the now former president of the United States Donald Trump has brought to light a long-debated topic of recent years, regarding which the institutions of the European Union, through the Digital Services Act package, have recently advanced an important proposal for reforming a legal regime that was drafted in 2000,[9] when many of the current digital platforms did not even exist.[10]

Concerning the status of Internet service providers, in fact, this is a legal issue that has often been at the heart of the attention of commentators and has given rise to several courts' decisions (both at national level and at the supranational level, in the EU legal system and in the Council of Europe),[11] without leading lawmakers to ultimately change the rules of the game.

The hesitation shown so far by the European Union institutions, which for some time have been quite reluctant to consider the option of shaping a new legal framework, should not, however, come as a surprise, especially if one bears in mind the legal, economic, and cultural conditions behind the adoption, both in the United States and in Europe, of the first rules on this subject.

It is not even a coincidence, perhaps, that before the aforementioned proposal for a regulation under the Digital Services Act came into play in Europe, even in the United States, attempts were made to shed some new light on the subject, albeit in the context of a strongly personal opposition between Donald Trump and some social networks, Twitter above all, in the context of the 2020 US general election.

In the United States, Internet service providers have benefited from a very favorable regime, based on the provision of Section 230 of the Communications Decency Act (CDA),[12] the first act regulating the Internet passed by Congress in 1996 with a view to prevent cyberspace from becoming a free zone where conduct prohibited in the real world could nevertheless occur.

[9] Proposal for a regulation of the European Parliament and of the Council on a Single Market For Digital Services (Digital Services Act) and amending Directive 2000/31/EC, Brussels, 15.12.2020, COM(2020) 825 final, 2020/0361(COD).

[10] Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market ("Directive on electronic commerce").

[11] For an overview, see Marco Bassini, "Mambo Italiano: the perilous Italian way to ISP liability," in Bilyana Petkova and Tuomas Ojanen, *Fundamental Rights Protection Online. The Future Regulation of Intermediaries* (Cheltenham-Northampton 2020), 84. For an in-depth focus on the implications on freedom of expression of the role of Internet service providers, see Ernesto Apa and Oreste Pollicino, *Modeling the Liability of Internet Service Provider. Google vs. Vivi Down: A Constitutional Perspective* (Milan 2014).

[12] 47 U.S.C. § 230.

According to the Good Samaritan clause enshrined in Section 230 CDA, Internet service providers enjoy a broad immunity in relation to any content moderation activities carried out "in good faith." This provision was of the utmost importance for the rise and expansion of the Internet as we know it today,[13] allowing service providers to escape from possible negative consequences (i.e., incurring liability) related to any act of content moderation, except for a limited set of derogations. Congress passed this provision with the primary goal of avoiding courts being able to analogize service providers to publishers and thus make them subject to the same legal regime based on direct liability. Indeed, an American court had already made this point in 1991, in the *CompuServe* case,[14] in which the court found that Internet service providers are comparable to book stores, public libraries, and newsstands, and as such merely act as distributors of third-party content. Nonetheless, in 1995 the Supreme Court of the State of New York delivered an opposite decision in *Prodigy*,[15] subjecting a service provider to the standard of liability applicable to publishers. In the latter judgment, the judges argued that the presence of a team of moderators and some guidelines intended for users of the platform made it possible to qualify the operator as a publisher and not a mere distributor of third-party content. The intervention of Congress in 1996 aimed to clarify this possible misunderstanding, avoiding any content moderation activity conducted in good faith being qualification as an index of editorial responsibility.[16] Of course, this provision dates back to an era when the Internet was not yet populated, as it is today, by the so-called web giants, and when therefore the absence of concentrations of power in the hands of a few subjects led to the presumption that it could fulfill the ambition of a free market of ideas, that is, the digital declination of that "marketplace" theorized by Justice Holmes in 1919 in his famous dissenting opinion in the *Abrams v. United States* judgment.[17] It is no coincidence that this provision has been at the center of numerous debates among American commentators, some of which have emphasized that the attitude of greater openness cultivated by the legislator at the beginning of the digital age has ended up placing a very important market power in the hands of a few operators. Nor is it a coincidence that for some types of infringements, the exemption from liability based on Section 230 CDA has been mitigated through the provision of notice and take down mechanisms, as in the case of copyright infringement, which falls under the provisions of the Digital Millennium Copyright Act.[18]

[13] A recent volume by Jeff Kosseff not surprisingly renamed this provision as "The Twenty-Six Words That Created the Internet" (see Jeff Kosseff, *The Twenty-Six Words That Created the Internet* (Ithaca-London 2019).

[14] *Cubby, Inc. v. CompuServe Inc*., 776 F. Supp. 135 (S.D.N.Y. 1991).

[15] *Stratton Oakmont, Inc. v. Prodigy Services Co*., 23 Media L. Rep. 1794 (N.Y. Sup. Ct. 1995).

[16] "No provider or user of an interactive computer service shall be treated as the publisher or speaker of any information provided by another information content provider."

[17] *Abrams v. United States,* 250 U.S. 616 (1919).

[18] 17 U.S.C. §§ 512.

These rules seemed, at the time, most suitable to give substance to the spirit of American constitutionalism with respect to the First Amendment, portrayed in its digital declination by the landmark *Reno* case delivered by the Supreme Court in 1997.[19]

In Europe, where the protection of freedom of expression is subject to a more balanced standard, it is not by coincidence that regulators took inspiration from the second model, based on the notice and take down mechanism, introducing it in the E-Commerce Directive in 2000. While this act has somehow prevented Europe from being an "easy land of conquest" for the American tech giants raised in Silicon Valley, it has nevertheless proved inadequate to capture the more and more complex nature of these services and of the relevant business models.

This brief overview of the origins of Internet service providers' liability should suffice to explain which reasons prompted the European Union institutions, also by virtue of all-but-enthusiastic results of the various self-regulation and co-regulation mechanisms undertaken so far, to plan a new regulatory intervention for this matter. A guiding factor of the new package of reforms is the awareness of the obsolescence of the rules on the liability of service providers, which no longer mirror the complexity and sophistication in the role of Internet service providers.

Recent events show the sensitive nature of content moderation and thus provide further justifications for the ongoing debate on possible reforms of the rules enshrined in the E-Commerce Directive. More and more, as noted above, digital platforms act as private powers, therefore competing, in a way, with public authorities in which governmental functions are traditionally and exclusively vested. The recent "battle" between Donald Trump and Twitter sheds light on the importance of the role of social networks at the intersection between power and democracy.[20] On one hand, social networks still qualify as private platforms run by operators that pursue their business, seeking maximization of the revenues they collect. One may thus shape the relationship between these service providers and the relevant users as a purely private one governed by the contractual terms and conditions both parties agree to abide by. On the other hand, however, the same relationship could be framed according to a different understanding, to the extent social networks constitute the main (and sometimes the only) avenue for individuals to express ideas and opinions, so that the deprivation of their use (for instance, because of the suspension or block of users' account) may be deemed to interfere with individuals' freedom of expression.[21] This problem has come into play most notably with respect to the role of content moderation, which may lead to the removal from digital platforms of pieces of content that do not necessarily amount

[19] *Reno v. American Civil Liberties Union*, 521 U.S. 844 (1997).

[20] See most notably *Knight First Amendment Inst. at Columbia Univ. v. Trump,* 928 F.3d 226 (2d Cir. 2019), now *Joseph R. Biden, Jr. President of the United States, et al., v Knight First Amendment Institute at Columbia University, et al.*, 593 U. S. ____ (2021).

[21] On these profiles see Giovanni De Gregorio, *Expressions on Platforms: Freedom of Expression and ISP Liability in the European Digital Single Market,* (2018) 3(2) *European Competition and Regulatory Law Review* 203.

to illegal conduct. If such removal can be justified on the basis of the terms and conditions entered into by the parties, a different conclusion may be reached assuming that digital platforms operate as public fora and constitute quasi-public services. In the latter scenario, in fact, service providers would be subject to the same obligations applicable to state actors (i.e., public authorities) for protecting freedom of expression. Content moderation, thus, would not be possible for pieces of content that public authorities have no right to censor or prohibit. Especially when cases like that of the opposition between Trump and Twitter arise, the removal of a post, the deletion of a comment, or the blocking of an account, even if legitimized on the basis of the terms and conditions of use of the service, probably no longer represent only choices made in the context of one's private autonomy from a private subject but become determinations with significant legal implications because of their effects on the digital public sphere.

In strictly legal terms, the key question concerns the possible equalization between the Internet (and social networks) and what in American jurisprudence is usually defined as a public forum, a "place" naturally designated for the exchange of ideas and opinions between individuals and therefore subject to only very limited restrictions. Admitting this equation would lead to a very significant reduction of the room for "private" content moderation, thus aligning the statute of freedom of expression on digital platforms with that in force outside this ecosystem. This option would pave the way for the application of freedom of expression with horizontal effects, as users could therefore enforce their right to free speech vis-à-vis the relevant service providers.

These legal issues already arose in the case law of the US Supreme Court, which precisely on the generalized prohibition, provided for by a North Carolina law, of accessing social networks for persons who had reported convictions for particular crimes, found a violation of the First Amendment in the 2017 landmark *Packingham* case.[22]

Other American courts have also had the opportunity to take the floor on this issue, but limited to cases that had to do with the use of social networks by institutional figures (including Trump) and which were therefore characterized by qualification of the account as a public forum used by a state actor. In another case in which no public figure was at stake (*PragerU v. YouTube*),[23] the Ninth Circuit Court of Appeals stated that an operator such as YouTube does not perform functions traditionally attributable to public actors, thus excluding a possible equalization.

Taken from this angle, the reform that the institutions of the European Union aim to implement in the field of digital services (but also markets) reveals the complexity of the various profiles behind it.

It is no coincidence, as already mentioned, that even in the United States, with a much-discussed Executive Order,[24] Donald Trump had tried to shift away the role of

[22] *Packingham v. North Carolina*, 582 U.S. ___.

[23] No. 18-15712. D.C. No. 5:17-cv-06064.

[24] Executive Order 13925 of May 28, 2020. Preventing Online Censorship.

intermediaries from that enshrined in the legal paradigm of Section 230 CDA. It is also no coincidence that before this attempt, the institutions of the European Union had tried to work "alongside" this legal framework, proceeding with a sectoral approach: First with the reform of the discipline on audiovisual media services (the so-called SMAV Directive 2010/13/EU),[25] and then with the more recent and much debated Copyright Directive (Directive (EU) 790/2019).[26] What both moves had in common was the attempt to shape a specific categorization of the platforms, going beyond the legal paradigm enshrined in the E-Commerce Directive and carving out special rules related to the peculiarity of the sector. The time to evaluate the profitability of this approach is not yet ripe, but perhaps it will be later, with the debate on the Digital Services Act in full swing.

3 Personal Data Protection: A New Paradigm for Regulating Digital Technologies

The reform that has taken place in the field of personal data protection, which resulted in the entry into force of the GDPR, shows a very close link that binds the revision of the EU legislation on personal data and the reform of the Digital Single Market.

In this regard, it should be recalled that the second pillar of this strategy, launched in 2015, corresponds to the creation of a favorable context for the development of digital networks and services. This objective could not be achieved in the absence of an adequate regulatory framework addressing the criticalities that the digital economy brings forward for personal data.

The European Union has been dealing with the protection of personal data since 1995, the year in which Directive 95/46/EC, the first act intended to harmonize the laws of Member States on the subject, entered into force. But this degree of harmonization, in the light of the peculiarities of digital technologies that are now implemented on a large scale, was no longer sufficient to ensure adequate protection of personal data in Europe. Hence the choice to replace the directive with a regulation which, being an act with general efficacy (applicable as such in every Member State of the EU), reaches the result of a uniform law applicable in each legal system.[27]

[25] Directive 2010/13/EU of the European Parliament and of the Council of March 10, 2010, on the coordination of certain provisions laid down by law, regulation, or administrative action in Member States concerning the provision of audiovisual media services (Audiovisual Media Services Directive).

[26] Directive (EU) 2019/790 of the European Parliament and of the Council of April 17, 2019, on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC.

[27] See for an overview Chris Jay Hoofnagle, Bart van der Sloot, and Frederik Zuiderveen Borgesius, "The European Union general data protection regulation: what it is and what it means" (2019) 28(1) *Information & Communications Technology Law* 65.

However, this change does not exclusively concern the type of regulatory act, but also the substance of the underlying legal paradigm. In fact, a new regulatory approach is inherent to the GDPR, the so-called risk-based approach, which marks the emancipation from a mostly "paternalistic," albeit justified, attitude that was behind Directive 95/46.[28] In a nutshell, the principle of accountability is the driving factor of the new legal framework; it makes data controllers not only liable but also accountable and thus responsible for the processing of personal data, drawing an important shift from a purely formal understanding of legal compliance to a more reputational and business-sensitive consideration of the value of personal data (that enjoy protection as fundamental rights under Articles 7 and 8 of the Charter of Fundamental Rights of the European Union). In view of this innovative approach, it is up to data controllers to implement the technical and organizational measures that are necessary to adequately protect personal data depending on the specific level of risk of the relevant processing operations.

This shift of paradigm can be understood in light of the historical and legal context: at the time of Directive 95/46/CE, the goal of the EU institutions was to establish a first set of safeguards for the protection of personal data in order to facilitate their free circulation across the Member States without unnecessary legal barriers. Personal data were, however, still subject to a predominantly economic understanding. Their free circulation required the implementation of a framework of safeguards such as that modeled by Directive 95/46, which not by chance embodied a quite paternalistic approach.

By virtue of the evolution of technologies over the last 20 years, which is mirrored by the important judgments delivered by the Court of Justice of the European Union to enforce the provisions of Directive 95/46/EC in the age of the Internet,[29] legal compliance has acquired a new and more deeper meaning. Compliance with the GDPR, in fact, stands out as a reputational factor that allows data controllers to make visible the efforts they have made to "take care" of personal data and of the protection of the rights and freedoms of individuals. GPDR compliance has thus become an opportunity for companies to act as more responsible business actors.

The rationale behind the risk-based approach encapsulated in the GDPR is well-described by one of its key provisions, namely, Article 25, named "Data protection

[28] See Orla Lynskey, *The Foundations of EU Data Protection Law* (Oxford 2015).

[29] See among others *Digital Rights Ireland et al,* joined cases C-293/12 and C-594/12 [2014]; *Google Spain,* case C-131/12 [2014]; *Maximillian Schrems v. Data Protection Commissioner,* C-362/14. See also Oreste Pollicino and Marco Bassini, "Bridge is Down, Data Truck Can't Get Through… A Critical View of the Schrems Judgment in the Context of European Constitutionalism," in Giuliana Ziccardi Capaldo (ed.), *The Global Community Yearbook of International Law and Jurisprudence 2016* (Oxford 2017) 245; Oreste Pollicino and Marco Bassini, *The Luxembourg Sense of the Internet: Towards a Right to Digital Privacy?*, in Giuliana Ziccardi Capaldo (ed., "Global Community Yearbook of International Law & Jurisprudence 2014" (Oxford 2015) 223.

by design and by default."[30] The principle of data protection by design requires that, taking into account the state of the art, the cost of implementation and the nature, scope, context, and purposes of processing, as well as the risks of varying likelihood and severity for rights and freedoms of natural persons posed by the processing, the controller shall, *both at the time of the determination of the means for processing and at the time of the processing itself*, implement appropriate technical and organizational measures. These measures (such as pseudonymization) implement data-protection principles (such as data minimization) in an effective manner and integrate the necessary safeguards into the processing of personal data. On the other—complementary—hand, the principle of data protection by default requires data controllers to implement appropriate technical and organizational measures to ensure that, *by default*, only personal data necessary for each specific purpose of processing are processed. This obligation applies to the various aspects of the processing of personal data, such as the amount of personal data collected, the extent of their processing, the period of their storage, and their accessibility. In particular, these measures shall ensure that *by default* personal data are not made accessible without the individual's intervention to an indefinite number of natural persons.

Against this background, the GPDR nevertheless shows some continuity with the pre-existing legal framework, where it more clearly differentiates itself from Directive 95/46/CE when outlining the obligations applicable to data controllers and data processors.

The processing of personal data can legitimately occur when one of the legal grounds provided by Article 6 is met. This catalogue reflects the same conditions that were embodied in Directive 95/46/EC, allowing for the processing of personal data, e.g., when the data subject has given consent to it, or when the processing is necessary for the performance of a contract to which the data subject is party, or for compliance with a legal obligation to which the controller is subject. Also, the processing is lawful when is necessary for the purposes of the legitimate interest pursued by the controller or by a third party (provided that such interests are not overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data). These legal grounds were already established by Directive 95/46/CE, thus adopting a merely formal approach one could correctly argue that nothing has changed in this respect. If this holds true on a purely formal basis, it is worth noting that in light of the risk-based approach, the legal basis offered by the pursuit of a legitimate interest of the controller may find a broader scope of application and constitute the condition that makes the processing of personal data lawful more frequently. Once again, the focus is on the ability of data controllers to conduct an evaluation of the circumstances of each case and assess whether, striking a balance, his/her/its legitimate interest justifies the processing of personal data of the data subjects. This explains why, even when the

[30] See also European Data Protection Board, *Guidelines 4/2019 on Article 25 Data Protection by Design and by Default,* 20 October 2020.

legal rules are still the same, the rise of a new paradigm of compliance may result in different outcomes.

A remarkably important novelty of the GDPR, which the Court of Justice of the EU had already outlined in the *Google Spain* case, concerns its territorial scope of application, which is now extended to the processing of personal data of data subjects who are in the EU carried out by controllers and processors not established in the EU, when they meet one of the following conditions: The processing of personal data is related to the offering of goods or services to data subjects in the Union; the processing of personal data occurs in the context of the monitoring of the behavior of data subjects that takes place within the EU. This provision, enshrined in Article 3, para. 2, marks a turning point that has significant implications, also in the context of the debate on digital sovereignty.[31] The Court of Justice had already made clear, albeit by interpreting a different legal provision, the rationale behind the extension of the territorial reach of EU law: if entities not based in the EU wish to take advantage of their ability to target European residents, thanks to the use of digital technologies, they cannot expect that this results in the deprivation of the rights that individuals enjoy under EU law. The Latin phrase *ubi commoda, ibi et incommoda* seems to capture the essence of this novelty: the non-EU entities wishing to process data of European residents for the purposes outlined in Article 3, para. 2, cannot escape the obligations under the GDPR. This is one of the reasons why the GDPR seems to be a more universal law governing the processing of personal information worldwide, with effects and consequences not limited to European Union Member States.[32]

In addition to that, evidence of the new digital context behind the GDPR emerges particularly in connection with the catalogue of data subjects' rights and data controllers' and processors' obligations.

With respect to the rights of data subjects, the GDPR confirms to a large extent the legal situations that individuals were entitled to under Directive 95/46/EC. However, the GDPR also establishes some new rights for data subjects, namely, the right to data portability and the right to not be subject to automated individual decision-making. These rights reflect the predominantly digital context of the processing of personal data. The right to data portability consists of the right of data subjects to receive the personal data concerning him or her, which he or she has provided to a controller, in a structured, commonly used, and machine-readable format and to transmit those data to another controller without hindrance from the controller to which the personal data have been provided. This right can be enforced when the processing is carried out by automated means and shall include the right to

[31] See the judgments of the Court of Justice in the *Schrems I* (C-362/14 [2015], *supra*) and *Schrems II* (*Data Protection Commissioner v. Facebook Ireland and Maximillian Schrems*, C-311/18 [2020]) cases. See also the *Google v. CNIL* judgment on the territorial reach of the right to be forgotten: *Google Inc. v. Commission nationale de l'informatique et des libertés (CNIL)*, case C-507/17 [2019].

[32] See also European Data Protection Board, *Guidelines 3/2018 on the territorial scope of the GDPR (Article 3)*, Version 2.1., 12 November 2019.

have the personal data transmitted directly from one controller to another, where technically feasible.

The second legal situation created by the GDPR consists in the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning the data subject or similarly and significantly affects him or her. This provision does not apply when the processing is (a) necessary for the entering into, or performance of, a contract between the data subject and a data controller; (b) authorized by EU or Member State law to which the controller is subject and which also lays down suitable measures to safeguard the data subject's rights and freedoms and legitimate interests; or (c) based on the data subject's explicit consent.

In the cases under (a) and (c), the data controller shall nonetheless implement suitable measures to safeguard the data subject's rights and freedoms and legitimate interests, at least the right to obtain human intervention on the part of the controller, to express his or her point of view, and to contest the decision.

Article 22 of the GDPR carves out a very debated provision, whose scope of application may perhaps go beyond the sole domain of data protection and thus encompass a variety of legal situations, including those where no processing of personal data actually occurs. This provision, in fact, may be interpreted as establishing some general constraints with respect to the implementation of algorithms and techniques that are likely to significantly affect individuals in a variety of situations, including the aforementioned case of content moderation (thus, with an influence on the right to freedom of expression). The rationale behind it can be better understood by looking at recital 71, which outlines a more elaborated definition of the rights that individuals may claim vis-à-vis the processing of data based on automated decision-making: the processing should be subject to suitable safeguards, which should include information specific to the data subject and the right to obtain human intervention, to express his or her point of view, to obtain an explanation of the decision reached after such assessment, and to challenge the decision. The actual existence of a right to obtain an explanation is by no coincidence one of the most disputed legal issues in the current debate on the large-scale implementation of algorithms, focused on how individuals may not be deprived of control of the processing of information and content.[33]

The most significant changes introduced by the GDPR, however, are placed on the side of compliance, as a consequence of the new paradigm based on the adherence to the so-called risk-based approach. The GDPR establishes a set of obligations applicable without distinction to data controllers and processors, also providing for a series of additional obligations in the presence of personal data

[33] See, e.g., Sandra Wachter, Brent Mittelstadt, and Luciano Floridi, "Why a Right to Explanation of Automated Decision-Making Does Not Exist in the General Data Protection Regulation," [2017] 7(2) *International Data Privacy Law* 76; Margot E. Kaminski, "The Right to Explanation, Explained," [2019] 34(1) *Berkeley Technology Law Journal* 189; Andrew D Selbs and Julia Powles, "Meaningful information and the right to explanation" [2017] 7(4) *International Data Privacy Law* 233.

processing that involve "high" risks for the rights and freedoms of the data subjects. The rationale underlying this articulation is quite clear: To facilitate an assessment of the actual level of risk for personal data (and individual rights and freedoms) by those subjects that are better placed to do so, i.e., the data controllers themselves. Indeed, Article 32 imposes upon data controllers and processors to implement appropriate technical and organizational measures to ensure a level of security appropriate to the risk. In assessing the adequacy of the security level, particular account is taken of the risks deriving from the accidental or unlawful destruction, loss, modification, unauthorized disclosure, or access to personal data transmitted, stored, or otherwise processed. These events are known as data breaches and are subject to an ad-hoc procedure by which controllers are required to notify these violations without undue delay (and possibly within 72 h of having become aware of it) to the competent supervisory authority.

Another general obligation requires data controllers and processors to keep records of processing activities. Generally, the obligation applies only to entities that have at least 250 employees or collaborators; however, such a quantitative requirement is replaced by a qualitative one under certain circumstances, for example, when the processing (even if conducted within organizations that do not exceed that threshold) still presents risks for the rights and freedoms of individuals.

On a second level, separate obligations apply to data controllers and processors when the processing of personal data is likely to result in a high level of risk for the rights and freedoms of individuals. Under these conditions, data controllers shall comply with the following requirements:

(a) Communication to interested data subjects in the event of a data breach (Article 34), that is due with a simple and clear language to inform individuals of the nature of the violation, except for where it would require disproportionate efforts or the controller can avoid the emergence of high risk for the relevant parties by adopting technical and organizational measures.
(b) Data protection impact assessment (DPIA), i.e., an assessment of the impact of the processing of personal data that includes an assessment of both the necessity and proportionality of the processing operations and of the risks for the rights and freedoms of the data subjects, as well as an indication of the measures envisaged to deal with the risks. When the impact assessment shows that the processing would likely result in high risk in the absence of mitigation measures adopted by the controller, the GDPR establishes an obligation of prior consultation of the competent supervisory authority prior to the processing operations being able to take place.
(c) The designation of a Data Protection Officer: this is a new figure shaped by the requirement for independence and competence. The DPO acts as a real supervisory body, exercising tasks and functions including the provision of information and advice in favor of the controller, monitoring on the effective application of the GDPR, and cooperation with the supervisory authority. The DPO must be "promptly and adequately involved in all matters concerning the protection of personal data" and provided by the controller and processor with the resources

necessary to discharge his/her duties and to access to personal data and processing operations.

This new legal framework, being grounded on the risk-based approach and shaped according to a flexible understanding of compliance, leaves data controllers with significant room to adopt the measures that better fulfill the obligations for the protection of data subjects' rights. However, this piece of legislation was framed with a clear understanding of the existing technologies at the time of its drafting, but may nevertheless give raise to new challenges with regard to disruptive technologies such as blockchain and Artificial Intelligence. The aforementioned Article 22 does not seem to capture the entire set of questions that these technologies advance nowadays. Some of these technologies (such as blockchain) may also be difficult to reconcile with the legal framework so defined when it comes to certain settings. For instance, public and permission-less blockchains may be difficult to subject to the GDPR, as far as certain provisions (such as those regarding the territorial scope of application or the right to deletion or to portability) apparently are not easily enforceable in such a digital environment. New efforts would be necessary from regulators and, where appropriate, courts to make sure that the same values that the GDPR safeguards can also be effectively protected in the context of disruptive technologies. As far as the right to be forgotten is concerned, the Court of Justice in *Google Spain* managed to enforce the Directive 95/46/EC provision on the right to cancellation vis-à-vis search engine service providers, achieving an important result by interpreting the rationale of the existing legislation and seeking a remedy that could fulfill that legal expectation in the digital world. There was no need, in other terms, to revisit the applicable law, albeit that the latter had been drafted in the pre-Internet era. Similar challenges and responses are then likely to also occur in the age of algorithms with regard to the GDPR.

4 Conclusions

The comparison conducted in the previous chapters between the domains of content and data in the European Union legal systems shows that digital technologies raise important questions that lawmakers have to address before it is too late. In the digital services market, for instance, the absence of a comprehensive legal framework has made it possible for online platforms to grow but ultimately also to acquire significant market positions that allow these new private powers to influence the circulation of content. Although content regulation is not directly the subject of an ad-hoc legal framework in the European Union and in the United States, it goes without saying that recent trends and events show the strong connection between the role of platforms and the actual scope of protection of freedom of expression. If at the beginning there were good reasons to believe that the absence of regulation would have proven beneficial and fostered the flourishing of new services, the time is probably ripe for a reconsideration of this original attitude of regulators, as content moderation carried out by social networks has proved to be more and more

influential. On the other hand, the legal framework applicable now to personal data shows a significant effort made by the European Union institutions to protect one of the core values of European constitutionalism (Europe's First Amendment, according to some scholars),[34] also vis-à-vis the role of digital platforms for which the processing of large amounts of personal data has been an inherent trait of their business model. The GDPR is probably not ready to face all the remarkable challenges and issues brought by disruptive technologies, but it is of course a good starting point whose effectiveness will be tested in the medium term. Also, it is based on a fairly flexible and open-ended approach, based on the idea that regulation can prove beneficial for both companies and individuals. It focuses on accountability and transparency, two values that may of course also play an important role in the context of the possible future regulation of online platforms, with a view to not placing constraints on the freedom to conduct business and the freedom of expression but to make and preserve the digital environment as a safer virtual square.

[34] Bilyana Petkova, "Privacy as Europe's first Amendment," [2019] 25(2) *European Law Journal* 140.

Enabling the Post-digital Enterprise

Severino Meregalli

Abstract

To transform the potential of the new digital technologies into real value, all enterprises need to embrace a different attitude toward digital innovation. This attitude is well defined by the "post-digital" approach that evades hype and unrealistic expectations and fosters principles such as the importance of understanding the theoretical pillars behind firms' performance and digital technologies, trust as key enabler of timely innovations and the importance of a mature approach to digital innovation. The chapter, building on DEVO Lab experience and field researches, describes the rationale and the features of the post-digital enterprise.

1 The Post-digital Era

In a context where hype and media noise create a lot of ambiguity about the real potential of many digital innovations, it is time to embrace a different attitude: the post-digital mindset. We must acknowledge that we will face a never-ending stream of new technologies that will keep impacting businesses and society. This situation is sometimes referred to as the "new normal" (Reiner et al. 2017), but we should also acknowledge that, in the end, this is not even "new" when we reconsider the impact of many other innovation waves in the past (e.g., the steam engine, electricity, the Internet) compared with the size of the gross national product of those times. Scientific progress and investments will keep generating innovation waves, as has happened in the past. The advent of the post-digital era is a time "when all phenomena will have become so naturally and inherently digital that people claiming

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to be experts in the digital will be seen as relics (comparable to those who would claim we need a corporate electrical strategy these days)" (Mueller and Hovorka 2021; Parmiggiani et al. 2020).

This new "normal" situation is the result of the evolution and combination of a long list of factors such as financial market dynamics, mobility, telecommunications, language knowledge, and demographics, the outcome of which is the current brave (new) and ever-changing world. In this scenario, we cannot afford to permanently live in an overexcited state of mind; we must come to our senses and realize that this set of circumstances is normal and extraordinary at the same time. An interesting perspective on this situation is the "post-digital" movement. The post-digital paradigm has its roots in many disciplines (art, philosophy, music, sociology, economics) that share the idea that post-digital does not refer to the life after digital, but rather attempts to describe contemporary technological opportunities to explore the consequences of the digital age on society (Cramer 2015; Cascone 2000).

In the post-digital era, digital represents an exhaustive end-to-end necessity, and the differentiator is now what companies do differently with digital, hence "post-digital." At the end of the day, the post-digital idea just calls for a more mature and pragmatic approach toward innovation that should always be the case in a business context. Thus, in the post-digital era, organizations need to adopt digital pragmatism (Nansen 2020) and look beyond technological evangelism. Applying the post-digital paradigm is the best way to create value using digital technologies and is the outcome of implementing a set of principles that are described in the following part of this chapter.

2 Digital Technologies as a Resource

Digital technologies (viewed as combinations of information, computing, communication, and connectivity technologies) are fundamentally transforming business strategies, business processes, firm capabilities, products and services, and interfirm relationships (Bharadwaj et al. 2013). These continue to dominate our economic and industrial landscape; organizations face increased scrutiny on how digital technologies can be leveraged to gain competitive advantage and superior performance. On the other hand, the more we keep saying that technological innovation is a compelling strategic need, the more we confirm that innovation is just the due diligence for surviving in the business arena. Notwithstanding the promising opportunities brought by digital technologies, we see examples where firms implement digital technologies to match up to the hype, rather than identifying problem areas that could be resolved using digital technologies (the age-old garbage-can management model at work).

Instead of considering digital technologies as a one-stop opportunity, business leaders should consider digital technologies as a resource, akin to other organizational resources such as human and financial resources. Adopting a resource-based view to digital technologies would allow managers to derive a sustainable competitive advantage from these technologies. Such an approach is thereby in line with the

resource-based view of the firm (Barney 1991). This would enable managers to develop digital capabilities, i.e., an organization's ability to mobilize and deploy digital technologies to effect the desired end, as an obvious basic aptitude of a company (Dias et al. 2017).

We call upon managers to evaluate digital technologies as a resource that is orchestrated along with other functional resources across the organization. Managers must recognize the pervasiveness of digital technologies in other functional areas such as operations, purchasing, supply chains, and marketing; and think beyond systems and structures that might have restricted the traditional views of digital technologies as restricted to the IT department. Thus, we advise managers to treat digital technologies as "resourceful" digital technologies. This is how digital technologies would be treated in a post-digital firm, creating a landscape of various digital technologies, structuring and bundling them for the specific use case under scrutiny. Viewing digital technologies as a resourceful asset would enable firms to develop digital capabilities and race ahead of competitors in the post-digital era.

3 Back to Theory

> There is nothing more practical than a good theory. (Kurt Lewin 1952)

Business leaders the world over are enamored with digital technologies—partly because a wide array of digital technologies have emerged during the last decade, partly because the potential of digital technologies is much talked about in the business press, and partly because they are cognizant of the fact that if implemented correctly, digital technologies could create value for their businesses. Yet, we see evidence of failed digital transformations or data science projects that have ended up as fiascos. For example, recent evidence reveals that only 13% of data science projects make it into production (i.e., 87% die as pilots or proofs of concept). Similarly, in 2015, MIT reported that "While businesses are hiring more data scientists than ever, many companies are struggling to realize the full organizational and financial benefits from investing in data analytics" (Stein 2015).

Businesses in their rush to launch digital initiatives tend not to pay enough attention to the building blocks of many of those emerging technologies considered so today. Dominant learning theories from varied disciplines and epistemological models have a significant influence on the implementation of emerging technologies in organizations. Hence, an in-depth understanding of the theoretical foundations of digital technologies is crucial to attaining a holistic understanding of the digital technologies under the lens. The word "theory" refers to a set of definitions, principles, and general laws that allow us to observe and interpret what surrounds us. Consider, for example, that the Internet of Things (IoT) has not been around for very long. However, there have been visions of machines communicating with one another since the early 1800s. Machines have been providing direct communications since the telegraph (the first landline) was developed in the 1830s and 1840s. Thus, the theoretical foundations of network and communications are essential for

understanding the implementation of IoT in organizations. Similarly, cybernetics, the study of "control and communication in the animal and the machine," computer science, statistics, and information theory, the study of the "quantification, storage, and communication" of information—all these theories influence the field of artificial intelligence as well (Redman and Davenport 2020). Thus, recognizing the foundations of theories in the field of mathematics, data management, and information processing is vital to realize value from data science and AI projects. Despite the obvious relevance of knowing and understanding the foundations of digital technologies, we can see an inclination to bypass these fundamentals and skip directly onto the applications. Realizing too late that most of the failures and difficulties are just the consequences of disregarded but existing bodies of knowledge. Sometimes we are dealing with digital techs like a space company refusing to study and acknowledge the relevance of the law of gravity because it was put forward in 1687.

The same attitude applies to the theory of the firm and markets. Much has also been shared about the phenomenon of value generation and value capture from digital transformation projects. Without understanding the funnel of value creation, the mechanisms, and the stakeholders involved, digital transformation projects are likely to land in a pothole. Finally, there is a fervent debate about the legal and moral implications of digital technologies. Themes such as platform regulation, speech, and intermediary liability; algorithmic bias and civil rights; autonomous systems, safety; "smart" contracting; data privacy; and consumer protection have begun to surface in the last few years (Albinson et al. 2019). Addressing these requires a thorough understanding of Intellectual Property (IP), contract law, privacy, and security, just to mention a few legal domains that are of utmost relevance in the digital world. But considering the inevitable gap between the current laws and the speed of technological innovation, organizations, inter alia, need to familiarize themselves with universal legal and moral principles to examine their implications for businesses.

The same logic applies to the theory of value creation, whose logical pillars are always an essential reference for managers facing the digital innovation riddle. Supply and demand interaction, risk vs return balance, the sustainability of competitive advantages, the relevance of understanding the value creation chain, and the key role of all stakeholders in value creation are just a small set of the theories that are always at work and whose effects transcend current contingencies (Porter 1980, 1985; Freeman 2010). Circumventing these fundamentals, thinking we are in a new economy, means missing the difference between the rules of the game and new tactics.

Hence, rather than relentlessly sponsoring, pursuing, and promoting "blind" digital transformation projects with massive budgets, we call for more attention to the elucidation of the varied theoretical foundations that can provide useful insights into the implementation and management of digital transformation initiatives. In the post-digital era, leaders should carefully consider that the only way to cope with a continuous stream of innovations and change is to master theories. In the ocean, you do not ask for a map but for orientation. Likewise, understanding the theoretical

pillars of value creation and digital innovations is the only way to navigate digital transformation.

4 The Importance of Trust: In "Experts" We Trust

> Leaders must recognize that human values, such as trust and responsibility, are not just buzzwords but critical enablers of their success. Paul Daugherty

As businesses transcend the digital and the post-digital era, the main factor enabling companies to take advantage of emerging trends in the post-digital age will be building trust in addition to building innovative digital products and services (Daugherty 2019). In digital businesses, establishing trust becomes an exponentially complicated task. Partly because, in digital business, things, algorithms, and other entities have agency, meaning that they can act on behalf of people and businesses. This implies that the "you" or "someone" that organizations need to trust can be a piece of algorithm or another business expert, which does not fall under our direct realm of control. Thus, trust in the digital era, or digital trust as has been defined by Gaehtgens (Gaehtgens and Allan 2017), is "not just about establishing trust between businesses, people and things. At its core, it is also about establishing trust in data, code, and software development practices."

There is no denying that the potential of emerging technologies such as the Internet of Things, blockchain, and artificial intelligence is staggering. But, understanding how these technologies can contribute to business transformation, adapting them to specific needs, and integrating them with an existing system is a daunting and challenging task. Resolving these challenges requires trusting in people and organizations who have both technological depth and breadth and the financial resources that can afford them to be competent. Establishing trust is an even more critical issue since evidence suggests that business leaders are reluctant to trust in their IT department's ability to drive transformation, as the IT department remains primarily focused on "keeping the lights on" and maintaining the daily churn (Doig 2018). Since digital transformation initiatives must incorporate institutional IT and other divisional managers, building trust among the two entities is essential. This implies that leaders of the technology domain must place trust in managers and vice-versa. This, inter alia, requires that IT leaders have the strategic sense to make technological choices that balance innovation and the ability to deal with technical debt (Davenport and Redman 2020).

Notwithstanding the strategic need to establish trust between the IT and managerial leaders in an organization, distrust among them can result in economic costs too. Studies have highlighted that one in six IT projects has an average cost overrun of 200% and a schedule overrun of 70% (Flyvbjerg and Budzier 2011). Many digital transformation projects have failed because firms lack internal capabilities. Companies that have never implemented digital transformation often lack the internal capabilities to build them. But many enterprises have been known to exhibit "not built here" syndrome, meaning they do not trust solutions that were not developed

in-house or were reluctant to trust outside experts. The firms in the post-digital era need to rethink this outlook and acknowledge that most businesses lack the internal capacities to build digital initiatives. This situation is completely normal, and at the same time, quite impossible to solve at the local level because the quantum of knowledge and experience needed to fully master digital innovation requires economies of scope, size, and knowledge that are out of reach for most business. Besides this acknowledgment, they need to embrace the "proudly found elsewhere" approach and need to place greater trust in vendors and other experts in the digital domain.

At the same time, it is important to avoid the pitfall of confusing the skills and knowledge of the so-called digital natives with the solution to the lack of expertise of senior management in the new digital issues. Too many have called for the need for new digital blood in corporate veins without a real understanding of the forces at play. While it is certainly a benefit to count on a new breed of human resources that are familiar with the new technologies, this does not mean that the same people have the characteristics needed to steer and manage the so-called digital revolution (Freeman 2010). By analogy, this would be like saying that because we are all familiar with car driving, we can be good decision-makers in the car industry business. Proficiency with digital tools and decision-making in digital investments requires a quite different set of skills and background knowledge. We need a massive intake of young, motivated people in business that are fit for fostering change and innovation, but not a horde of millennials whose quality of skilled digital tech users will fade away quickly if not supported by more profound knowledge (Stillman 2017). A post-digital company hires and tries to attract young talents (not digital natives or millennials) and is not impressed by the evident fact that most people born after the 1980s have a better attitude toward digital technologies.

Thus, even though the need to establish trust in digital artifacts, domain experts, and technology providers has been established as a core element of the digital era, leaders will have to look beyond this perspective in the post-digital era. Technologies, and consequently service providers, are not the "magic wand" who are to be entrusted with the task of putting digital technologies to work, assuring the security of the systems and confidentiality of our data. Leaders need to trust the experts in the digital domain and the vendors to run successful digital transformation projects and act without mercy against all players that will eventually betray their "trust."

5 Entrepreneurship as Usual

Digital entrepreneurs are often advised to stay lean, adopt a garage mindset, and be agile: e.g., "Bring a garage mindset to the C-suite strategy meeting." While this startup mindset might have been beneficial in the digital age, in the post-digital era, executives do not need to stress the idea that a digital startup or entrepreneurial venture requires a different mindset. Unfortunately, too many entrepreneurial ventures begin with a specific technology, in search of a problem to solve—after

all, as they say, if all you have is a hammer, you treat everything as a nail. Entrepreneurs in the post-digital era must imbibe a business orientation, which focuses on growth and customer-centricity. In multiple cases though, what we witness is that entrepreneurs get so tangled in the development of their new tech solutions that revenue and profit are far down the priority list.

In recent years we have seen an overemphasis on storytelling, with digital startups narrating how their product or service is going to change the world, an uncanny focus on the startup culture, and their growth plans. While these storylines do initially attract customer attention for a while, they are often created with the motive of generating some sort of hype. The storytelling approach adopted by digital startups often lacks market research and real customer insights. It is time that digital entrepreneurs, or startups as we might call them, overcome their fascination with storytelling and turn to market orientation, which is critical for all businesses regardless of their structure or orientation, entrepreneurial or non-entrepreneurial, and digital or non-digital. Market orientation is a philosophy of "business management, based upon a company-wide acceptance of the need for customer orientation, profit orientation, and a recognition of the important role of marketing in communicating the needs of the market to all major corporate departments" (Kohli and Jaworski 1990). Organizations that value a market orientation philosophy can better understand customer needs and hence can provide superior products and services to their customers (Hair et al. 2012).

Another caveat that entrepreneurs should consider cautiously is the excessive reliance on incubators and accelerators. Over the past few years, the popularity of startup accelerator programs such as AngelPad, Y-Combinator, TechStars, and 500 Startups has risen steeply. Accelerator and incubation programs do prove helpful during the fundraising season and provide valuable exposure to potential investors and similar startup ventures. While on the surface, this support seems great, it tends to divert startups' attention from core issues, which are customer orientation and market research. Entrepreneurs, therefore, end up spending too much time in networking and pitching their products and services (Sridharan 2016), when they should be investing efforts in knowing more about consumer needs. Entrepreneurs in the post-digital era must come to terms with the fact that digital does not discriminate, and so they need to approach their ventures with the same mindset adopted by each and every successful entrepreneur.

6 Beyond Dual Models: Going Beyond Separating Digital and Traditional

The rapid proliferation of digital tools and technologies has established a business imperative that every company aspires to be—in some way—a digital firm or a tech-driven organization. Digital and traditional initiatives are often launched as separate initiatives while continuing to operate the traditional business. For example, it is well established that marketing and IT executives often do not speak the same language or understand each other's goals or roadmaps, probably since the former is fixated on

adopting the latest technologies, while the latter is focused on governance, security, and enterprise architecture (Protexter and Shumway 2016).

Despite the call for digital and traditional businesses to bridge the gap between the digital and the traditional, a vast majority of businesses still draw a hard line between digital and traditional divisions, in the way they think and in the way they run their departments. For example, many organizations have separated their traditional marketing and digital marketing units, organizing tasks into digital and traditional results in both tangible bottom-line costs and lost opportunities. There are several instances of waste and inefficiency due to running an organizational division in which digital and traditional efforts are disconnected (Cheinman 2017). Examples include duplication of roles and responsibilities, lack of accountability, key activities being missed, development of two separate divisional plans, inability to make digital relevant to customers' everyday needs, and creating organizational silos (when the focus should be on busting the divisional silos). Ensuring that their digital transformation efforts fall in line, we invite the business leaders to shift their thinking from "digital vs traditional" to just "functional" and then take actions within their organizations to integrate the two.

To better illustrate the argument, consider the case of a marketing unit in an organization. There is not an iota of doubt that the diverse range of digital channels to reach and engage with customers has resulted in a raft of digital marketing specialists who specialize in Google AdWords, SEO optimization, or social media marketing. Consequently, traditional and digital marketing have emerged as two different domains, wherein the domain of traditional marketers typically relates to branding and channels like radio, outdoor, and print, while the new digital world falls in the lap of digital marketers. Such an arrangement based on establishing separate entities and groups to deal with digital and non-digital/traditional initiatives might as well lead to performance gains in the short term. But practitioners (and common sense) contend that when digital and non-digital initiatives are housed with separate organizational groups, tangible benefits to consumers in the form of faster turnaround or better service often get reduced due to trade-offs between the divisions (Dias et al. 2017). Moreover, in our present era, we can say that there is no digital marketing vs marketing, but just (contemporary) marketing, which takes advantage of all channels and tools available.

The same notion applies to the plethora of "digital" labels added functions (i.e., Digital Innovation Officer) based on the idea that creating dual models and specialized entities will deliver better results. Even if this could work as a first response or to give a boost to the adoption of some digital innovations, in the long run this organization falls short in avoiding duplications, promoting integration and conveying the idea that principles of successful innovation are universal.

Instead of working on separate digital initiatives inside organizational units, companies should holistically consider how both digital and non-digital initiatives can contribute to bringing a distinctive customer experience, adding value to the company, or create sustainable completive advantages. One way to do this is to direct attention to external and the internal processes that support value creation. These naturally cut across organizational divisions—for example, you require

marketing, operations, credit, and IT to support a customer opening a bank account. Thus, the business leaders should focus on leveraging the synergies between the digital and traditional business models, while striving to get rid of the divisions between them, and think about how these two modes can be integrated rather than separated.

7 A Mature Approach to Adoption Instead of Digital Hoarding

During the last decade, many companies have been affected by a sort of technological FOMO (Fear Of Missing Out) syndrome (Newman 2018). The outcome of this has been the proliferation of POC (Proof of Concept) projects without a clear definition of the purpose or, even worse, a sort of digital technology hoarding (in addition to technology hoarding, organizations tend to engage in digital hoarding, which is the excessive accumulation of virtual goods including databases, videos, and images) (Oravec 2018). While it is true, on one hand, that is quite difficult to resist the marketing and sales capabilities of the offer, reinforced by the bombardment of publications and success stories, on the other hand, selecting and prioritizing investments remains one of the key success factors in any context. The call is for a mature approach to innovation and technology adoption: if you want to increase your knowledge, you do not just buy many books, but you choose them and, more importantly, you read them! Likewise, we cannot mystify digital innovation with an increase of digital investments without a strategy or a purpose. A mature approach to digital innovation, for instance, could encompass the option of not being on the frontier waiting to better understand how to combine all the pieces in a sounder digital strategy.

Multiple examples illustrate this point. For instance, many "big data" projects focused on the adoption of multiple analytical software tools realizing too late the obvious fact that to get new insight on data, it is very often necessary to invest in a stack of technologies for data acquisition, data cleaning, data analysis, data presentation, and data protection, to name but a few. Ex post, this seems obvious, but the lack of infrastructure and the "right" data is the number one reason for the shortcoming of many big data projects (Redman and Davenport 2020). The same situation is happening in AI, where many companies driven by hype are investing in the "tip of the iceberg" without considering the cost and the need for the hidden part of the iceberg. In many digital transformation initiatives, the only evident trend is a sort of "brute force" digital investment strategy without the necessary rationale. There is nothing new under the sun, as for every investment the "why" and "how" is more important than the "how much."

In more general terms, if the key success factors of a company are not IT based, such as in the case of most Italian manufacturing companies, where IT is a key support function but not essential, there is no reason to rush and pile up digital projects. Every innovation stream causes a sort of juvenile reaction that also has the

positive side of enthusiasm, but what is at stake now in terms of risks and opportunities requires a quick exit strategy from digital adolescence to maturity.

8 The Post-digital Enterprise

Wrapping up the concepts expressed in this chapter and in the whole book, we can conclude by highlighting the importance of being a post-digital enterprise. To make the most of the immense opportunities arising from digital innovation, we envision a post-digital enterprise that has a set of features that make it fit not only to survive the digital revolution but to prosper in exploiting it. A post-digital enterprise understands that the savvy adoption of digital technologies is the baseline for surviving in this business scenario. Digital technologies are like travels operated by transportation technologies; we all know we can travel the world: have breakfast in Milan and a business meeting in Paris a few hours later thanks to the combination of an endless number of technological assets. Even if this result is the outcome of an extraordinary stack of technologies, nowdays we consider it normal, and we focus on deciding if the trip makes sense compared to a web conference or choosing if we should go to Paris by plane, car, or train. The post-digital enterprise has the same attitude toward digital technologies, seeing them as a resource and not as an end.

The post-digital enterprise understands the complexity beyond technologies and recognizes the importance of having access to high-quality knowledge and of expertise in digital domains being developed internally, when size allows it, or by involving outside sources. In this kind of enterprise, there is no room for pseudo-experts or tinkering on such critical issues. It has a strong sense of curiosity and an appetite for innovation because it knows that digital technologies are the cornerstone of a contemporary approach to value creation and preservation. But at the same time, the post-digital enterprise works to achieve a digital maturity that allows it to escape the hype and focus on the real advantages of digital technologies when the time is right. All decisions on adopting and investments in digital technologies are value-driven and continuously challenged against its entrepreneurial values and value creation structures. It can separate "due diligence" from real innovation that is rare, hard to achieve and to protect, and in most cases expensive.

In the post-digital enterprise, the term "innovation" is used with respect and in rare and well-documented situations. In a post-digital organization, the management fosters critical thinking at all levels and does not advocate the adoption of "best practices" as a replacement for good analytical and ad-hoc thinking. The same existence of "best practices" is challenged by the post-digital attitude, while this is one of the features of the hype-driven enterprise. At best we can assume there are "good practices" to confront, but the idea of having the "best" solution is either another way to define the obvious or is not consistent with the degree of complexity and changes we are facing. Contemporary companies know that they must find new paths, and try not to reinvent the wheel. In the end, the moral here is that in our times there are no decision-making shortcuts and there is no substitute for critical thinking practiced by well-prepared managers.

In all sectors where digital innovation is not the key success factor, the post-digital enterprise behaves as a "smart" procrastinator, which does not mean delaying digital projects, lagging behind peers, or being indifferent to digital innovations, but rather spending extra time introspecting, learning, and reflecting on the real value and consequences of emerging technologies. Procrastinating strategically helps to nurture new ideas, fosters creativity, and inculcate out-of-the-box thinking (Grant 2016). Being a follower with a better understanding of the factors at play gives a much better competitive advantage than rushing to implement digital innovations without intent. In markets where the first mover approach in digital innovation does not give a substantial advantage (i.e., in most manufacturing companies), it is definitely better to "wait and think."

Since the foundation of DEVO Lab in SDA Bocconi, we have fostered the post-digital mindset and strived to apply it in practice thanks to the support and input received by all lab members. In this quest for the right balance between research and implementation, we have partnered with several companies representing the supply and demand side of the digital world, which share the same principles and values of our manifesto (see chapter "Disruptive as Usual: A Manifesto for the Digital Age"). One of the best examples of this journey toward the post-digital approach is the pursuit of the right approach to combine tradition, company values, and digital opportunities carried out with Brunello Cucinelli S.p.A. The research program started in 2018 in collaboration with the DEVO Lab under the name of "Fabbrica Contemporanea" (contemporary factory). The results of the research have shown that in sectors with a high level of added value, like luxury goods, it is crucial to spend all the time that is necessary to ponder the adoption of new digital technologies from all angles because the risk of destroying value is very often higher than the chances of creating new value. For example, the idea of using full body scanners and robots to cut perfect made-to-measure suits would not support the idea of craftsmanship and exclusiveness that justifies a high premium price and could potentially tarnish a well-established luxury brand. At the same time, the solution is not to postpone digital contamination or even worse, to seclude Brunello Cucinelli in a time capsule with no room for innovation driven by new digital technologies. Having this in mind, after a long process of studying Brunello Cucinelli's business model and of learning from success stories and failures, the joint research team determined that the correct way to embrace digital technologies in this context is based on the idea of an "invisible digital augmentation" of Brunello Cucinelli's key success factors, complemented by the constant check of the impact on its value chain, values, shareholders, and stakeholders. The outcome of these ideas has been riveting applied research in the post-digital adoption of state-of-the-art digital innovations such as intelligent vision systems for quality control, a historical first in embedding an RFD in a single fiber of cashmere yarn for product tracing, and a complete research stream on the invisible augmentation of the tailor's craftmanship in cooperation with the MIT Design Lab. The research program has confirmed all the hurdles and issues linked to a successful adoption of new digital technologies, but also the high potential of these innovations when they are applied with the help of

knowledgeable suppliers and with a constant check and balance in terms of value chain impact.

The post-digital enterprise measures its success by consistent performance and steady growth; it understands and copes with exponential phenomena but perceives them as the normal progression of the combined effects of many factors at play and not as a radical change in the building blocks of value creation. Thus, a steady and informed approach is likely to succeed better in the digital race (Business Times 2019). The post-digital enterprise likes the idea of being a mature, contemporary organization living at the fullest extent of its capabilities and preparing for the future.

> The digital revolution is over; let's embrace the post-digital era. Nicholas Negroponte, MIT Media Lab

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