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Carolina Machado *Editor*

Technological Challenges

The Human Side of the Digital Age

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Editor
Carolina Machado
Department of Management
School of Economics and Management
University of Minho
Braga, Portugal

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Preface

Living us in a digital age, this book, entitled *Technological challenges: the human side of the digital age,* looks to cover technological challenges with a special emphasis in what concerns the challenges that modern organizations are facing as well as their implications in the human factor. It will focus the challenges that human resources are facing in nowadays' digital era, where organizations, integrating a highly competitive environment, suffer growing and challenging technological changes. Indeed, in order to be competitive and develop a proactive position in the market in which they are integrated, organizations pay a particular attention to the changes and demands placed by different stakeholders. Endowed with greater information and training, stakeholders are increasingly demanding of organizations, expecting from these innovative products and quality service, able to provide them with a complete satisfaction of their needs. Technological innovation is undoubtedly an opportunity for organizations to develop more creative and innovative products and services. However, to truly realize the technological potential, organizations need to prepare internally to meet the technological challenges and impacts that result from the digital age in which we live. What impact will be felt within organizations to exploit that potential is the question we raise and to which the book proposed here seeks to contribute. In particular, this book is intended to highlight some of the key implications that the challenges of the digital age are having on organizations, with particular emphasis on the people who are part of them. Considering human resources as the differentiating factor that can bring added value to organizations, it is extremely important to know and better understand the implications that will be felt on them. In other words, in the digital age, and following the technological challenges that are being felt, what impacts and/or changes are observed on the human side of organizations.

Based in these concerns, this book looks to provide discussion and the exchange of information on principles, strategies, models, techniques, methodologies and applications of technological challenges in a digital era in the field of industry, commerce and services.

Designed to contribute to the development of the skills required in the digital age, the knowledge and management tools provided by this present book can be very useful for all those that, hand in hand with undergraduate and graduate students,

pursuing a managerial career in the different types of organizations look to acquire the knowledge and know how necessary to drive the organizations to the success.

Aiming to increase the knowledge and effectiveness of all those interested in the challenges arising from the digital age and their impacts on the people who make up the organizations, as well as the organizations as a whole, the present book, organized in six chapters can be used for academics, researchers, managers, engineers, practitioners and other professionals in related matters with management and business.

Technological Challenges: The human side of the digital age begins with "Exploring Digital Technologies and Data: A Societal Level of Analysis Approach", focuses on "Towards a Unified Theory of the New Market Realities in Cyber-Physical Design Search Spaces" discusses "Digital Literacy of Digital Natives", highlights "The use of Gamification in Training and Socialization Processes in a Multicultural Context" deals with "Human Resource Management Practices in the Digital Era", and speaks about "Strategic Human Resource Management: Importance of Tangible Analysis of Indicators".

The editor acknowledge her gratitude to Springer for this opportunity and for their professional support. Finally, we would like to thank to all chapter authors for their interest and availability to work on this project.

Braga, Portugal Carolina Machado

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Editor and Contributors

About the Editor

Carolina Machado received her Ph.D. degree in Management Sciences (Organizational and Policies Management area/Human Resources Management) from the University of Minho in 1999, Master's degree in Management (Strategic Human Resource Management) from Technical University of Lisbon in 1994 and degree in Business Administration from University of Minho in 1989. Teaching in the Human Resources Management subjects since 1989 at the University of Minho, she is since 2004 an Associated Professor, with experience and research interest areas in the field of Human Resource Management, International Human Resource Management, Human Resource Management in SMEs, Training and Development, Emotional Intelligence, Management Change, Knowledge Management and Management/HRM in the Digital Age/Business Analytics. She is the Head of the Human Resources Management Work Group at the School of Economics and Management at the University of Minho, Coordinator of Advanced Training Courses at the Interdisciplinary Centre of Social Sciences, a Member of the Interdisciplinary Centre of Social Sciences (CICS.NOVA.UMinho), University of Minho, as well as the Chief Editor of the International Journal of Applied Management Sciences and Engineering (IJAMSE), Guest Editor of journals, books Editor and book Series Editor, as well as reviewer in different international prestigious journals. In addition, she has also published both as editor/co-editor and as author/co-author several books, book chapters and articles in journals and conferences.

Contributors

Andrezza Fernandes School of Economics and Management, University of Minho, Braga, Portugal

Marco Fernandes School of Management, Polytechnic Institute of Cávado and Ave, Barcelos, Portugal

Hafinas Halid School of Business and Social Sciences, Albukhary International University, Alor Setar, Malaysia

Siti Noorjannah Abd. Halim School of Business and Social Sciences, Albukhary International University, Alor Setar, Malaysia

Qeis Kamran ISM-International School of Management, Dortmund, Germany

Carolina Feliciana Machado School of Economics and Management, University of Minho, Braga, Portugal;
Interdisciplinary Centre of Social Sciences (CICS.NOVA.UMinho), University of Minho, Braga, Portugal

Márcio Melo School of Economics and Management, University of Minho, Braga, Portugal

Pedro Novo Melo School of Technical Short Cycles, Polytechnic Institute of Cávado and Ave, Braga, Portugal;
Interdisciplinary Centre of Social Sciences – CICS.NOVA.UMinho, Braga, Portugal

Kamalesh Ravesangar School of Business and Social Sciences, Albukhary International University, Alor Setar, Malaysia

A. Reshani ISM-International School of Management, Dortmund, Germany

Ana-Marija Stjepić Faculty of Economics & Business, University of Zagreb, Zagreb, Croatia

Dalia Suša Vugec Faculty of Economics & Business, University of Zagreb, Zagreb, Croatia

S. Topp ISM-International School of Management, Dortmund, Germany

Alina M. Waite Indiana State University, Terre Haute, IN, USA

Exploring Digital Technologies and Data: A Societal Level of Analysis Approach

Alina M. Waite

Abstract While the digital age is upending traditional views of the world, it offers abundant promise to better society. Digital technologies including artificial intelligence, Big Data, cloud computing, 5G wireless technology, and the Internet of Things, in combination with data, shall bolster productivity, create efficiencies, offer flexible work schedules, and increase access to information and knowledge sharing. After introducing digital technologies and data, this chapter presents an emerging performance framework in the context of digital transformation and explains the three performance needs (digital strategy, digital infrastructure, and governance) across the societal level of analysis. Guided by enabling questions, digital strategy, digital infrastructure, and governance are explained through case examples. This chapter is not intended to be all-inclusive, but rather to provide a macro-view of performance as policymakers and business, government, and world leaders navigate the digital future.

Keywords Digital technologies · Data · Performance · Society

1 Introduction

Alerts of an approaching tsunami are sounding. Digital transformation is sweeping across every industry, country, and part of the globe, requiring business, government, and world leaders to act (Hanelt et al., 2021; Kraus et al., 2021; Siebel, 2019). It is leaving organizations, regions, and nations that are complacent in its wake and spurring others to create and innovate. Countries willing and able to embrace digital technologies and reimagine themselves by embedding data in their DNA will emerge amid the chaos. Frontrunners of the digital age will flourish by seizing vast opportunities presented with this magnitude of change happening globally. Failing to heed the urgency to evolve (Siebel, 2019), some countries will fall behind (Manyika et al., 2015). Worse yet, Murat Sönmez, founding Head of the World Economic

A. M. Waite (✉)
Indiana State University, Terre Haute, IN, USA
e-mail: Alina.Waite@indstate.edu

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Forum's Centre for the Fourth Industrial Revolution during a 2019 debate, suggested countries without data, or countries with data but unable to harness them due to limited digital technologies, will find themselves challenged to cross the rapidly expanding digital divide and forever left behind (WEF, 2019).

This chapter is divided into four main sections. First, data and digital technologies that form the backdrop of digital transformation are introduced. Second, a performance framework that is emerging in the digital age is presented. Third, three performance needs across the societal level of analysis are explained. These include digital strategy, digital infrastructure, and governance. This last section is guided by enabling questions, which are addressed through case examples. Concluding remarks are also offered.

2 Digital Age

The digital age is unfolding in new and unpredictable ways. Digital transformation is a disruptive revolution that is also commonly called the Fourth Industrial Revolution or Industry 4.0 (Siebel, 2019). Digital transformation is happening worldwide at varying speeds; advances in technology are affecting personal lives, economies, and society, in general.

Countries compete globally for economic growth and security. People's happiness, health, and prosperity are inextricably linked to their countries' strategic initiatives. Countries are racing to capitalize on digital transformation, which promises to generate efficiencies, improve products and services, and create high-wage jobs that are meaningful, to name just a few examples.

In its report, *A roadmap toward a common framework for measuring the Digital Economy*, the Organization for Economic Cooperation and Development (OECD) stated:

> The Digital Economy incorporates all economic activity reliant on, or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services and data. It refers to all producers and consumers, including government, that are utilising these digital inputs in their economic activities. (Hatem et al., 2020, p. 5)

While the digital age purports to deliver abundant opportunities for everyone, the journey is not one without risks. For example, digital transformation poses many policy challenges related to data privacy, digital equity and access, digital gender divides, and digital security (OECD, 2021d). As an international organization that works to build better policies to improve lives, the OECD brings together policymakers and the world's leading experts from across the globe to develop solutions to social, economic, and environmental challenges. Moreover, various international organizations are actively collaborating with the OECD to develop approaches and indicators for measuring and understanding the digital economy: the European Commission, the International Telecommunication Union, the United Nations Conference on Trade and Development, the United Nations Educational, Scientific

and Cultural Organization (UNESCO), and the World Bank Group (Hatem et al., 2020).

Successfully navigating the digital age with all its complexities and potential benefits for society requires that governments work closely with citizens, organizations, and stakeholders to chart the road ahead (OECD, 2019). Digital transformation takes place against the backdrop of data and digital technologies (OECD, 2021d), which are presented below.

2.1 Data: The Source

Data infiltrate nearly every aspect of people's daily lives—while working, exercising, shopping, and communicating with others. Although surrounded by data, people are typically not conscious of the data individuals and companies generate and consume every day. Bar codes, for example, are data carriers, and most consumer goods contain bar codes. When people shop at grocery or retail stores, a barcode is scanned each time a product is purchased at the checkout counter. A standard universal product code (UPC), which has a series of straight lines and spaces along the x-axis, is read with a UPC reader (Banton, 2021). The newer QR code, with squares, dots, and other shapes along the x- and y-axes, is scanned using an App on a mobile device (Banton, 2021). The two designs differ significantly in terms of data. The UPC typically holds 12 digits but no letters; whereas the QR code contains more than 7,000 digits and 4,000 letters, and therefore, accommodates more detailed product information (Banton, 2021). While the advent of the traditional barcode automated manual entry of price tags at the register, which cut down customers' wait times, the emerging QR code allows manufacturers to engage directly with consumers via their phones while they shop and make final selections. Since cross-border data flows are possible, manufacturers can reach consumers nearly anywhere and help shape their experiences.

Quantitative and qualitative data not only surround us, but also tell important stories that can increasingly improve people's lives and well-being. Negnevitsky (2011) described data generally as facts, measurements, or observations. In today's digital age, the OECD (2021d) provided a more concise definition of data, "recorded information (in transit or stored) in structured or unstructured digital formats, including text, images, sound, and video" (Understanding data—para. 1). Digitized data are represented in numeric format, typically in a series of zeros and ones that is understood by a computer's central processing unit. A bit is a zero or one and a byte equates to 8 bits. The term digitization describes "the conversion of information into digital form" (Hatem et al., 2020, p. 7). Digital technologies and operations capture, convert, and interpret analog data created in the natural world into digital images and forms. Digitization is different than digitalization, which means "applications of digital technologies" (Hatem et al., 2020, p.7). As Siebel (2019) cautioned, however, "digital transformation is not a series of generational changes in information technology or simply the migration of a company's processes, data, and information

onto a digital platform" (p. 11). Leveraging so much data to create value—especially economic and social value on a national scale—requires a paradigm shift (da Costa Junior et al., 2019).

Table 1 presents examples of digital data sources, requirements (for data to be useful), and uses. Data come from people, the natural world, and increasingly the virtual world. The amount of data the world generates daily continues to soar and by 2025, is estimated to reach 463 exabytes—212,765,957 DVDs per day (Desjardins, 2019). Having the largest population in the world, it is not surprising why the People's Republic of China's (hereafter China) data are predicted to account for 27.8% globally by 2025 (Si, 2021). Population growth—projected to reach 9.7 billion by 2050 (United Nations, 2019)—in combination with emerging digital technologies like the Internet of Things, will continue yielding exponential increases in data.

"Data can be copied and re-used endlessly; transferred across the world in milliseconds; and used for multiple, simultaneous and distinct purposes" (OECD, 2021d, Understanding data—para. 2). Despite these distinct advantages, obstacles still exist. Having no data or a lack of data impedes our understanding of events. Conversely, troves of data that are not clean serve little purpose or can lead to poor decisions. When working with large data sets, limitations like incomplete coverage and inconsistencies may exist. Having data that are accurate and timely is, therefore, optimal, so information can potentially be put to good use. Citizens of countries able to generate the greatest volume of accurate data, harness the data near- or real-time, and make use of the data will benefit most in the digital age. Murat Sönmez (WEF, 2019) referred to data as the oxygen for Industry 4.0, or the source for a lot of future developments. The use of data underpinned by digital technologies (OECD, 2021d)

Table 1 Examples of digital data sources, requirements, and applications

Data sources	Data inputs	Data uses
Biometric	No data	Interpret findings
Health	Quality data	Report findings
Lifestyle	Accurate data	Track progress
Population	Timely data (e.g., time lag)	Monitor trends
Safety	Incomplete data	Identify emerging threats
Environmental	Comparable data	Make predictions; modeling
Energy	Similar definitions/methods	Make informed decisions
Financial		Solve real-world problems
Transportation		Benchmark success
Economic		Ensure accountability

may, for example, provide flexible work schedules, improve health outcomes, and alleviate poverty.

2.2 Digital Technologies: The Engine

Digital technologies—elastic cloud computing, Big Data, the Internet of Things (IoT), and artificial intelligence (AI)—are propelling digital transformation (Siebel, 2019). While the IoT offers a new means to capture data, artificial intelligence (AI) and deep learning, on the other hand, make use of that data. Computing processing power is also rising as the amount of data increases (Kambatla et al., 2014). McKinsey Global Institute reported advances in robotics, AI, and machine learning, noting automation technologies may possibly reach superhuman levels of performance (Manyika et al., 2017). In its *Digital Economy Outlook* report, the OECD (2017a) highlighted the IoT, 3D printing, and advanced robotics. Moreover, the OECD (2017b) indicated a confluence of these three digital technologies, advanced materials, and new processes (e.g., AI) is propelling this next revolution. In other words, an ecosystem of interconnected digital technologies underpins digital transformation and will continue to drive continuous change through the digital age (OECD, 2021d). The more that governments understand how digital technologies can transform the production and the delivery of goods and services, and also enhance productivity, digital skills, income distribution, well-being, and the environment, the better positioned they will be to face the challenges and reap any benefits (OECD, 2017b). Digital technologies including AI, Big Data, cloud computing, and the IoT are defined in Table 2.

Varying definitions of emerging digital technologies abound in the literature. AI is no exception, and sometimes the term is even over-hyped. While the goal of AI is to create machines that think like humans, they are not intelligent just yet (Grensing-Pophal, 2021). An extended working group of the World Commission on the Ethics of Scientific Knowledge and Technology explains that AI machines have "human-like learning capabilities" and are "potentially capable of imitating or even exceeding human cognitive capacities, including sensing, language interaction, reasoning and analysis, problem solving, and even creativity" (Hu et al., 2019, p. 1). AI relies on algorithms; an algorithm is a sequence of instructions that allows a computer to convert input data to output data. Whereas machine learning is a broad subset of AI, deep learning is a subset of machine learning. Deep learning extends the capabilities of machine learning because important features do not necessitate data curation and are instead learned by algorithms. Many AI applications require large volumes of data to *train* algorithms and improve as datasets increase in size (Siebel, 2019); Big Data are such datasets (Andersen, 2018; Hu et al., 2019).

Big Data are generated by ongoing activities, such as commercial transactions, people's use of their mobile devices and computers, and increasingly the IoT (Chang et al., 2014; Gandomi & Haider, 2015; Goes, 2014; OECD, 2019). Generally, IoT refers to a trend "in integrating digital capabilities (i.e., network connectivity and

Table 2 Examples of digital technologies and definitions

Data technology	Author	Key attributes
Artificial intelligence (AI)	Hu et al. (2019, p. 1)	AI is reliant upon algorithms that "embody 'machine learning' or even 'deep learning,' using 'neural networks that mimic the functioning of the human brain"
Big data	NIST NBD-PWG (2015, p. 4)	"The inability of traditional data architectures to efficiently handle the new datasets." "Characteristics of Big Data … are: *Volume—the size of the dataset, *Variety—data from multiple repositories, domains, or types, *Velocity—rate of flow, *Variability—the change in other characteristics"
Cloud computing	Mell and Grance (2011, p. 6) Grijpink et al. (2020, pp. 18–19)	"A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or services provider interaction" User devices running cutting-edge applications likely require cloud computing. Cloud computing provides a boost in processing for certain applications demanding "high computational power, storage capacity, and advanced data analytics capabilities"

(continued)

computational capability) with physical devices and engineered systems to enhance performance and functionality" (Greer et al., 2019, p. 1). Simply, the IoT connects any smart device equipped with adequate processing and communication capabilities to the internet and sends and receives data. Examples range from wearable medical devices to autonomous vehicles.

Cloud computing enables the application of AI to data sets of any size; without cloud computing, digital transformation would not be possible (Siebel, 2019). The

Table 2 (continued)

Data technology	Author	Key attributes
Internet of things	Greer et al. (2019, p. 7)	"The idea of IoT is to interconnect the physical world with the digital world" Object categories that define IoT by their capabilities are: *Trackable—mobile things aware of physical location, *Data—things producing data (from sensors or current state), *Interactive—things that allow interaction with environment, *Smart—interactive things that can apply processing to data and act accordingly

term cloud describes the business model of providing services across the internet. Broadband high-speed internet is a prerequisite to harness the power of many digital technologies. Fifth-generation wireless technology (5G) is the first mobile network designed to integrate a plethora of devices with humans (WEF, 2021). The World Economic Forum (2021) anticipated 5G's impact in both emerging and developed economies across three themes: industrial growth, social cohesion, and national development. It is not surprising that demands on networks are growing as more people and things go online.

Efforts are needed to further develop AI, Big Data, and other digital technologies and integrate them and data at scale with society. The next section presents an emerging performance framework in the context of digital transformation.

3 Emerging Performance Framework

Public- and private-sector organizations and government agencies continually devise creative business strategies to remain competitive and achieve desired results (Menz et al., 2021). Their effectiveness relies on continuous performance improvement and change. While automation led organizations and industries to simplify work and increase efficiencies to keep pace, digital transformation demands revolutionary change in a changing society (Siebel, 2019). A new performance framework is emerging in the digital age, which expands existing boundaries and complicates current and new relationships. This section continues by summarizing a traditional performance framework using a systems theory approach and presenting an alternative view considering the evolutionary nature of the increasingly connected digital world.

Rummler and Brache (1990) conceived the Three Levels of Performance Framework with organizations in mind. Systems theory underpins the framework because it lends a holistic view of a complex, adaptive system for problem-solving purposes. The framework considers an organization's performance needs (goals, design, and management) across the major performance levels (organization, process, and job performer). Goals are tied to strategy, which sets the overall direction of a business. Design reflects the way an organization is arranged so that goals can be efficiently met (Kretschmer & Khashabi, 2020). Last, management considers managerial practices and policies to ensure continuous performance improvement. A macro-view of an organization looks at the performance management system. Processes are steps taken by employees to transform raw materials into deliverables. This intermediate level is thought to be pivotal, as "both strategic and operational issues are best understood at the activity level" (Porter, 1985, p. xv). A micro-view of the organization entails the human performance system, which is "the people an organization employs to produce products and provide services" (Gilley & Maycunich, 2000, p. 4). Business models have evolved over the last few decades, giving rise to a fourth level of the vertical tier. Cummings and Worley (2004) considered workgroups, consisting of job performers working together on a shared task. Swanson (2007) integrated teams, defined as "groups of workers functioning interdependently and sharing a common purpose (McLean, 2005)". Beyond these four, Garavan et al. (2004) introduced a community-societal level of analysis while exploring human resource development.

Digital transformation is disrupting the traditional web of horizontal and vertical relationships and how organizations, economies, and society interact and adapt (Balakrishnan & Das, 2020; Hanelt et al., 2021; Kraus et al., 2021; Kretschmer & Khashabi, 2020; Siebel, 2019). Disruptive changes pervade all aspects of society and have institutional, societal, and environmental implications (Kraus et al., 2021; Siebel, 2019; Usai et al., 2021). The societal level of analysis is becoming preeminent (da Costa Junior et al., 2019). Garavan et al. (2004) indicated the societal level emphasizes the development of society, national competitiveness, and working together in a supportive system that shares information and services for a common purpose. According to the OECD, "the Digital society extends further than the Digital Economy incorporating digitalised interactions and activities excluded from the GDP production boundary" (Hatem et al., 2020, p. 5).

Countries are leveraging digital technologies and data to create value and improve people's lives (Hatem et al., 2020; OECD, 2019). Inputs, throughput, and outputs extend beyond the physical domain, to digital. Data flows are borderless. Cloud computing, Big Data, AI, and the IoT are converging into new forms of processes. The shift to and the characteristics of Big Data (Ghasemaghaei, 2021) are dictating new data system architectures and different data life cycle processes to maximize efficiencies (NIST NBD-PWG, 2015). Steps of a data life cycle include "collection of raw data, preparation of information, analysis of patterns to synthesize knowledge, and action to produce value" (NIST NBD-PWG, 2015, p. 8). Buer et al. (2018) proposed a data-driven process improvement cycle (data collection, sharing, analysis, optimization, and feedback) with a typology for guiding digitalization efforts.

Notwithstanding the continuous flow of voluminous data that traverse boundaries, the environment itself is in a constant state of flux. The speed at which change is occurring in the digital age is significant. The OECD described an international ecosystem through which data are gathered, sorted, and transmitted for measuring the digital economy (Hatem et al., 2020). According to McKinsey Global Institute, the connectivity ecosystem will become filled with more technologies, services, and providers (Grijpink et al., 2020). As disruption occurs, the definition of a customer is also shifting. Now, everyone in the ecosystem is considered a customer, requiring management of end-to-end customer experiences. Siebel (2019) predicted that as the adoption of AI, blockchain, autonomous vehicles, and the like grows over the next decade or two, and people become accustomed to the digital environment, that environment will have likely already transformed. Environment forces, once considered economic, political, and cultural (Swanson, 2007), increasingly include matters like cyber security, privacy, ethics, and health.

Performance needs are also considered at the societal level of analysis. A digital strategy is an action plan to achieve goals utilizing digital technologies in the connected world (Menz et al., 2021). Organizations and even countries often develop strategic plans specific to digital technology like AI (Borges et al., 2021). A digital infrastructure (e.g., communication networks and services, capacity for data storage and processing) permits diffusion and effective use of digital technologies. It is crucial for differentiation (i.e., competitive advantage) via digital technologies. Management supports the successful implementation of digital technologies, which rapidly evolve. Lichtenthaler (2021) underscored the importance of data management efficiency for shared value innovation; the concept seeks to strengthen a company's competitive advantage while improving economic, environmental, and societal conditions.

The view of our world looks very different than it did even just two years ago. The coronavirus pandemic (COVID-19) that began sweeping across the world from December 2019 through spring 2020 led to significant loss of lives and drastically upended livelihoods (Leonardi, 2021) and public, private, and government operations (MGI, 2020; Peng & Kathuria, 2021). Through a systems theory lens, COVID-19 magnified existing imbalances in countries' capacities and their abilities to address the threat. In particular, the World Health Organization (WHO) acknowledged "the serious gaps in timely, reliable, accessible and actionable data and measurements that compromise preparedness, prevention and response to health emergencies" (WHO, 2020, p. viii). Although COVID-19 eclipsed digital transformation in the news, digital technologies and data have proven critical in helping countries combat and recover from COVID-19 (OECD, 2021a). Moreover, COVID-19 merely accelerated digital transformation and its profound impact in reshaping economies and societies globally (Blackburn et al., 2020; Kraus et al., 2021). It propelled digitalization of remote work, online education, and e-commerce. Consumers have increasingly moved online (MGI, 2020), forcing companies and industries to rapidly respond.

There is no better time than the present to contemplate digital transformation and identify performance initiatives being taken globally by various organizations and government agencies. The next section presents the three performance needs (digital

strategy, digital infrastructure, and governance) across the societal level of analysis in the context of digital technologies and data.

4 Societal Level of Analysis

Digital technologies and data are being woven into the fabric of society, gradually displacing the tried and familiar ways people have contributed to society with alternative forms of producing economic and social value. What impact will these changes have on society? What are the potential implications of this shift for society at large? The choices people make now will profoundly impact future generations. As Davis (2016) pointed out, "it is not just the choices of the researchers, inventors and designers developing the underlying technologies that matter, but even more importantly those of investors, consumers, regulators and citizens who adopt and employ these technologies in daily life" (para. 6). Table 3 highlights the societal level of analysis and summarizes digital strategy, digital infrastructure, and governance (i.e., performance needs). Discussion is guided by enabling questions, which are addressed by case examples.

4.1 Digital Strategy

Rummler and Brache (1990) identified the first performance need as goals, which is tied to strategy. According to the OECD (2019), many countries have a digital transformation strategy or an equivalent plan in place; however, not all digital strategic plans offer a holistic approach with an eye to coordination among all stakeholders and at all levels. Coherence between national and international plans and/or policies is also critical. Key elements of a digital strategy are a strategic vision for the country's digital transformation, goals that are measurable, an adequate budget, and tracking and evaluation (OECD, 2019). Digital strategy is explained through different case examples, guided by the enabling questions listed in Table 3.

Table 3 Societal level of analysis: three performance needs in the digital age

	Digital strategy	Digital infrastructure	Governance
Societal/National level	1. Why use digital technologies and data? 2. Who benefits from digital technologies and data? 3. Where are digital technologies and data employed?	1. What support structure is in place that enables the strategic goals to be efficiently met?	1. What policies and practices are being adopted to ensure infrastructure is current and strategic goals are being achieved?

4.1.1 Why Use Digital Technologies and Data?

Digital technologies and data hold tremendous promise for empowering society (Hatem et al., 2020). Countries compete globally for economic growth and security. People's happiness, health, and prosperity are inextricably linked to these goals. Countries are racing to capitalize on digital transformation, which promises to generate efficiencies, improve products and services, increase access to education and healthcare, and create high-wage jobs that are meaningful.

Increase Innovation for Economic Growth

In 2015, the Australian Government committed AUD$1.1 billion over four years to spur innovation and reap the benefits of new technologies, processes, and services (Commonwealth of Australia, 2018). The Government launched the *National Innovation and Science Agenda* (NISA), underpinned by culture and capital, collaboration, talent and skills, and Government as an exemplar (Commonwealth of Australia, 2015). In 2018, the Australian Government publicly released *Australia 2030: Prosperity through Innovation* to grow and expand the economy. Australia's 2030 vision to become globally recognized as a top tier innovation nation promises to benefit all Australians. The strategic plan seeks breakthrough discoveries and solutions to today's challenges and is driven by advancing technologies, such as genomics, data analytics, and materials science. The plan identifies five strategic imperatives: (a) educate all Australians by equipping them with skills relevant to 2030, (b) stimulate industry to ensure prosperity, (c) ensure Australia becomes a global leader in innovative service delivery, (d) improve research and development (R&D) effectiveness, and (e) cultivate a national culture of innovativeness (Commonwealth of Australia, 2017).

Develop Comprehensive Infrastructure for Economic Expansion and International Cooperation

In 2013, China's *Belt and Road Initiative* (BRI) was said to primarily bolster trade and ties between China and Europe, Asia, and the Middle East (Morgan Stanley, 2018). The Chinese leadership's vision of BRI encompasses five components: policy coordination, infrastructure connectivity, unimpeded trade, financial integration, and people-to-people exchanges (Rolland, 2019). Beijing's anticipated completion date for BRI is the mid-twenty-first century. BRI parallels two other strategies launched in 2015, the *Made in China 2025* plan and an *Internet Plus* strategy. The former aims to upgrade ten high-tech industries, while the latter sets to strengthen a high-tech digital sector. In 2015, a published white paper "called for the development of 'an information silk road' and the construction of cross-border optical cables and telecommunications networks, transcontinental submarine cable projects, and satellite passageways" (Eurasia Group, 2020). In 2017, China's President unveiled

the *Digital Silk Road of the 21st Century*, moving it to the forefront of BRI. The DSR strategy called for further integration of AI, nanotechnology, and quantum computing, as well as development of Big Data, cloud computing, and smart cities (Eurasia Group, 2020). BRI continues to expand land and maritime trade connections and by 2019, reportedly included 123 countries situated along six international economic cooperation corridors (Rolland, 2019).

Become Digital Frontrunner for Competitive Advantage

The Government of Denmark similarly envisions its country being a digital frontrunner. In 2018, Denmark released its *Strategy for Denmark's Digital Growth*. With data considered a driver of growth and prosperity, the strategy encompasses AI, Big Data, and the Internet of Things. Denmark's three objectives for digital growth include: (a) ensure Danish businesses are among the best using digital technology, (b) create optimal conditions to support digital transformation of business, and (c) promote digital literacy through education and training so that all Danes are equipped to operate in digital transformation (The Danish Government, 2018).

Strengthen Focus on AI Globally for Inclusive, Sustainable Growth

Competition in AI is accelerating. Investments in research and development (R&D) in AI are occurring in all industries worldwide to varying degrees, noting nearly 21,500 patents in computers and electronics alone between 2012–2014. The OECD studied the top 2,000 R&D companies' patent activity between 2012 and 2014 and found the number of AI inventions increasing at twice the average annual growth rate observed for patents overall (UNESCO, 2018b). R&D companies based in Japan (33%), the Republic of Korea (20%), USA (18%), Taiwan (9%), and China (8%) accounted for about 88% of all AI patents over the same period (OECD, 2017c). This high concentration of AI inventions in five countries and fear of being left behind led a growing number of countries to adopt national AI strategies. Canada was the first country to release an AI strategy in 2017 and was closely followed by Japan. By the end of 2018, about 25 countries either launched an AI plan or contemplated one. It's been said that no two strategies are alike, with each country having its own set of goals (Dutton, 2018).

In 2017, Canada announced the *Pan-Canadian Artificial Intelligence (AI) Strategy*, which was the world's first national strategy for AI (UNESCO, 2018a). The five-year, CAD$125 million plan is supported by the federal government to advance AI research and develop talent. The strategy has four objectives: (a) increase the number of prominent AI researchers; (b) establish three centers of excellence in AI research and innovation; (c) support a national research community on AI; and (d) develop global thought leadership on economic, ethical, policy, and legal implications of AI (CIFAR, 2017). This strategy differs from other countries' strategies because it

primarily aims to enhance Canada's international profile as a leader in AI research and training (Dutton, 2018).

To enhance its DSR, China set its sights on leading the world in AI innovation by 2030. The 2017 *Next Generation Artificial Intelligence Development Plan* stated goals for R&D, industrialization, talent development and acquisition, standards setting and regulations, ethical norms, and security (Dutton, 2018). Alongside its AI rollout, China is investing heavily in Human Resources, providing services domestically and abroad, to guarantee a tech savvy workforce, especially in AI and related areas. China is also investing heavily in 5G, constructing 5G networks to expand coverage and capacity. As of early 2020, China already built more than 160,000 base stations covering more than 50 cities (The State Council, 2020). The 5G wireless technology hosts stable mobile services, robots, remote work, Big Data analyses, and other areas needed to realize China's DSR.

4.1.2 Who Benefits from Digital Technologies and Data?

While countries strive to be inclusive, it is possible not everyone will be able to engage in and benefit from digital transformation. Evidence suggests "certain groups are being left behind in terms of access to and use of digital technologies" (Hatem et al., 2020, p. 11). The digital economy is still evolving and its impact on society is yet to be unveiled.

Everyone Benefits Including Vulnerable Populations

In 2015, the United Nations adopted the *Transforming our world: The 2030 Agenda for Sustainable Development*, which outlines seventeen goals related to people, planet, prosperity, peace, and partnership (United Nations, 2015). The first Sustainable Development Goal, for example, is to end poverty in all its forms everywhere. Goal 5 aims to close the gender gap and empower all women and girls. Goal 7 ensures energy for everyone. Advances in digital technologies and data promise to at least alleviate some of society's most pressing challenges and promote more inclusive and sustainable growth for future generations. Despite potential benefits, divides in engagement exist in the digital age. Gaps in terms of access to and use of digital technologies and data exist between countries and between different groups within countries.

All Citizens Benefit

India is one country that made inclusive growth part of its digital strategy. A government mandate in 2018 led the National Institution for Transforming India (NITI) to establish a national strategy on AI. The strategy was named *#AIForAll* with a focus on leveraging AI for inclusive growth. The plan's overarching goal for India

is to build a vibrant AI ecosystem, which includes reskilling and training to promote quality jobs, investing for economic growth and social impact, and integrating AI in the rest of the developing world (NITI, 2018). Target domains deemed important to society include agriculture, healthcare, education, smart cities/infrastructure, and smart mobility/transportation (Dutton, 2018). NITI also sponsors lectures that feature influential speakers from all parts of the globe. NITI Lectures attract policymakers, academics, experts, and administrators to India. The fourth lecture, *AI for ALL: Leveraging Artificial Intelligence for Inclusive Growth*, was delivered by the President of NVIDIA Corporation in 2018. NVIDIA Corporation is an American multinational leader in AI computing and is based in California (NVIDIA, 2021). Beyond India's AI initiative, NITI drafted a discussion paper, *Blockchain: The India Strategy*, in 2020, and a vision document, *National Data and Analytics Platform* (NDAP), in the same year. The latter aims to move beyond generating and harnessing data for social good to promoting easy access and better use of data (NITI, 2020).

All Businesses Especially Small- to Medium-Sized Enterprises and Government

Japan experienced a particular hardship because of COVID-19, which exposed an overreliance on paperwork while shifting to remote work from home (Bremer, 2021). This occurred despite Japan's highly skilled workforce and leadership in cutting-edge technologies like robotics. Small companies apparently lagged in adopting digital tools, which exacerbated the economic impact during the pandemic. The OECD Economic Survey (2021), therefore, made several recommendations, such as diffusing new technologies throughout business and government to reach smaller entities and promoting training to enhance digital competencies (OECD, 2021b).

Everyone Benefits Especially Marginalized Groups

Many parts of the world face needless challenges due to discrepancies in data. These gaps could be low quality data, incomplete data with lapses in time, or even a lack of data altogether. The WHO (2021) suggested these "data blind spots" mask true struggles of people living in various countries or marginalized groups within countries. As a result, problems that may otherwise be resolved persist. Following the World Bank country income classifications schema (2018), WHO (2020) reported most high-income countries accounted for the greatest amounts of recent data for the 46 health-related SDG indicators. Differences were also observed within income groups. While not a surprise, these findings serve a stark reminder that much work is yet to be done around data availability and reporting systems before people with less income can also have their needs equally met. Another reported gap is the lack of disaggregated data (WHO, 2020). Data are more readily available for male and female combined than they are broken down by sex. Without sex-specific data, gender inequalities cannot be addressed.

4.1.3 Where Are Digital Technologies and Data Being Employed?

G20 members are innovating and adopting a host of digital technologies and business models. E-commerce is perhaps the most well-known example even though not everyone participates just yet (Hatem et al., 2020).

E-commerce—Digital World

The rise of the internet has led to new opportunities for consumers and businesses. According to the International Trade Administration (ITA), "[e-commerce] includes: (a) the sale through a website, (b) the online advertising that leads to a sale, and (c) the brand building that helps tie it all together as a narrative for consumers" (ITA, 2021). Many countries aspire to increase their e-commerce cross-border transactions. "An e-commerce transaction describes the sale or purchase of goods or services conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders" (OECD, 2011). E-commerce occurs domestically and internationally, and in a variety of contexts: business-to-business (B2B), business-to-consumer (B2C), business-to-government (B2G), government-to-business (G2B), consumer-to-consumer, or consumer-to-business. The ITA offers guidance and resources to assist U.S. organizations with implementing a digital strategy for cross-border e-commerce. Considerations for the proliferation of e-commerce include information technology infrastructure, regulatory landscape, and economic integration (OECD, 2017c).

Precision Agriculture—Globally with Prospects for Rural Economies

Precision agriculture (PA), for example, is a modern approach to farm management that potentially offers profitability, sustainability, and environmental protection worldwide. PA utilizes specialized equipment, predictive analytics software, and information technology (IT) services to access sensor data about crops, soil, air, and weather patterns. Imagery from satellites and drones combined with real-time data, let farmers know precisely how to manage their crops and soil for optimal productivity, thus eliminating waste. Mobile Apps, drones, and cloud computing open possibilities of PA to smaller family-owned farms who would otherwise be unable to afford costly equipment and the necessary IT infrastructure. Unless fully integrated, however, information and communication technology (ICT) will isolate PA from the poorer and the unconnected. Improvements to ICT via connectivity, increasing access, and lowering costs are required. Moreover, inclusive digital strategies should also support knowledge and skills acquisition in the use of these more advanced digital technologies and data.

4.2 Digital Infrastructure

Rummler and Brache (1990) noted the second performance need is design. In other words, structure "needs to include the necessary components, configured in a way that enables the goals to be efficiently met" (Rummler & Brache, 1990). The demand for and supply of digital infrastructure including 5G is constantly increasing (Hatem et al., 2020). Hatem et al. (2020) considered physical, service, and security infrastructures that underlie the digital economy. Infrastructure developments require a coordinated effort by G20 members to optimize investments. Recognizing a need for quality infrastructure investment aligned with economic and development strategies, the Global Infrastructure Hub, the OECD, and The World Bank jointly developed an online database for policymakers and practitioners who plan and implement infrastructure (Global Infrastructure Hub, 2019). The Quality Infrastructure Investment (QII) database contains helpful resources (e.g., guidance documents, toolkits, reports) and facilities (e.g., financial support by way of grants, etc.). Digital infrastructure is described through a case example that is guided by an enabling question from Table 3.

4.2.1 What Support Structure Is in Place That Enables the Goals to Be Efficiently Met?

China has arguably undertaken the world's most ambitious infrastructure project in modern times. This country, therefore, serves as a good case example about digital infrastructure. The project began in 2013 with China's President's two-pronged approach: a *Silk Road Economic Belt*, stretching across the land from China to Europe, and a *21st Century Maritime Silk Road*, connecting China to Europe across the Indian Ocean. Collectively, these were referred to as "One Belt, One Road" in English and in late 2015, became the "Belt (railroads) and Road (maritime routes and ports) Initiative" (Morgan Stanley, 2018). Since 2017, the *Digital Silk Road* (DSR) and a *Silk Road in Outer Space* extended BRI beyond just the physical domain. China's DSR is significant because it is not only the loftiest digital infrastructure plan of all countries, but it also attracts the most attention from around the world. China's digital footprint is expanding "in the development of fifth-generation (5G) wireless technology, weapons enabled by autonomy and AI, power grid cybersecurity, financial technology, biotechnology, surveillance technologies, semiconductors, and space technology" (Brookings Institution, 2020).

China leads the world with the largest optical fiber and 4G and 5G broadband networks (Xinhua, 2021). China's 5G is essential in its concerted effort to upgrade the economy and transform digitally (Wei, 2020). The nation's 819,000 + 5G base stations represent approximately 70% of such facilities in the world (Shijia & Jun, 2021). Beyond network hubs and data centers that are spread in key regions across the nation (Shijia & Jun, 2021), it is accelerating its 5G + industrial internet rollout

Table 4 Digital infrastructure: potential benefits and applications

Benefits[a]	Applications[b]
Fosters economic growth	Online working
Ensures economic efficiency	Distance learning
Addresses social and economic impacts	Telemedicine
Overcomes digital divide	Mobile payments
Promotes industrial upgrading	Online shopping, entertainment, and tourism
Transforms industries	Online sports and fitness
Creates jobs	Autonomous driving
Bolsters protection of privacy	Intelligent manufacturing
Secures networks and data	Smart cities
Deepens international cooperation	Disaster warnings

[a] Global Infrastructure Hub (2019), People's Daily (2020), Shijia and Zhenhuan (2021), and Wei (2020)
[b] Shijia and Zhenhuan (2021), Wei (2020), and Xinhua, 2021

(Xinhua, 2021). Transforming industries require the government to prioritize investments, apply new investments, eliminate barriers to cross-sector applications, and create new applications that drive consumption. The new infrastructure shall encompass a range of sectors, such as 5G telecommunications, the industrial internet, AI, blockchain technology, and Big Data (Wei, 2020). Table 4 provides potential benefits and applications of the new infrastructure.

4.3 Governance

Rummler and Brache (1990) identified the last performance need as management, which is required to "ensure that goals are current and are being achieved". The OECD is particularly active in various policy areas related to digital transformation, such as quality infrastructure investment and data governance, which consider the entire data life cycle. The OECD explores the relationship between data and digital technologies, which is pivotal in the digital age (OECD, 2021d). The OECD (OECD, 2021d, Understanding data—para. 4) recognized that different data types may require different policies. To illustrate differences, the OECD compared personal health data to freely available open-source data (e.g., government data). Governance is reviewed through a case example that addresses the enabling question listed in Table 3.

4.3.1 What Policies and Practices Are Being Adopted to Ensure Infrastructure Is Current and Goals Are Being Achieved?

The Group of Twenty (G20), a forum of 19 countries and the European Union, was established in 1999 to focus on international economic and financial matters. The members of the G20 represented "85% of global GDP, 75% of international trade and two-thirds of the world's population" (OECD, 2021c). Since 2008, leaders of the G20 members have met at least annually following the global economic downturn to help stabilize markets, restore growth, and prevent future financial collapse. G20 Leaders' Summits have addressed some of the world's most pressing concerns, such as aging societies, climate, energy, and inclusive growth. Summit agendas have also considered a broad range of issues, from economic development, migration, and national security to global health, digitization, and the future of work.

At the 2016 Summit in Hangzhou, China, G20 leaders discussed the increasingly digital world and centered an inclusive growth strategy around innovation (OECD, 2016). They also enlisted the Organization for Economic Cooperation and Development (OECD) for support in designing policies related to the ongoing digital transformation. A year later in Hamburg, Germany, G20 leaders considered an ambitious G20 digital agenda (OECD, 2017d). The G20 members undoubtedly recognized the need for global cooperation given the importance of digital technologies for the economic performance and well-being of everyone. Notwithstanding its Going Digital Project (OECD, 2021d), the OECD continues to make important contributions to the G20 (OECD, 2021a).

The OECD continues working to understand the potential benefits of digital technologies and data. As such, the OECD (2019) created a digital integrated policy framework to shape digital transformation for growth and well-being. The framework with seven policy dimensions centers around growth and well-being, which focuses on access, use, innovation, jobs, society, trust, and market openness (OECD, 2019). Table 5 summarizes societal challenges and opportunities in each of the seven areas and corresponding policy considerations.

5 Concluding Remarks

As the digital age unfolds in the decades to come, digital technologies and data will continue to offer an abundant array of opportunities and pose unique challenges. This chapter initially considered the digital age driven by data and digital technologies, such as AI, Big Data, cloud computing, and the IoT, at the societal level of analysis. It then introduced a performance framework that is emerging because of digital transformation. Last, digital strategy, digital infrastructure, and governance were considered across the society level of analysis. Guided by enabling questions, these three performance needs were described using case examples. Performance solutions are not a one-size-fits-all and certainly, the answer to each enabling question was not as simple as yes or no. Rather, this chapter offered a macro-level view of different

Table 5 Going digital: examples of policy considerations to address risks/opportunities [a]

Policy dimension	Challenges/Opportunities	Policy considerations
Access	• Many countries unable to support projected network demands • Rural areas often lag urban areas • Access to data underpins digital transformation	• Drive competition to increase investment in communication infrastructures and services • Boost connectivity in remote areas • Promote access to and sharing of data, while balancing pros and cons
Digital use	• Widening digital skills gap • Small firms less likely to perform Big Data analyses • Mistrust of online security	• Address training and education • Diffuse digital tools to all firms • Increase awareness and empower people and firms to manage risks
Innovation	• Some countries less likely to innovate than others • Private sector often spends more in R&D • Digital sectors with younger firms tend to be dynamic and innovative	• Reduce regulatory barriers and increase financing • Re-evaluate regulations considering digital age • Invest in R&D and intangible assets • Foster knowledge sharing
Jobs	• Digital sectors account for new jobs • STEM graduates vary across countries • Low-skilled workers face need to up-skill or re-skill	• Promote fair transitions for displaced workers • Review labor laws, etc. to ensure portability of benefits, for example • Emphasize cognitive skills, and life-long learning
Society	• Digital divides persist across demographic spectrum • Use of digital technologies (e.g., social interaction, flexible working schedules) varies	• Include everyone in digital society, notably women, elderly, low income through social policies • Take advantage of digital technologies and data to address societal challenges (e.g., health care)
Trust	• Security and privacy concerns with internet use • Transparency on purposes and uses of personal data • Consumer protection concerns	• Make digital security risk a strategic priority • Provide a national privacy strategy • Support digital consumers who encounter challenges
Market openness	• Imbalance of competition, trade, and investment • Potential of e-commerce and digitally delivered service impeded • Tax systems out-of-date to meet challenges of digital age	• Monitor market dominance • Lower trade barriers (outdated or inefficient regulations) • Reduce barriers to international investment • Ensure tax systems are relevant in digital age

[a] OECD (2019)

undertakings by policymakers and business, government, and world leaders as they navigate the digital age.

Discussion about the digital age highlighted important considerations for data and digital technologies. Digital transformation is occurring globally at varying speeds and in different parts of the world. As data become increasingly critical to power digital technologies, more attention will be needed through all phases of the digital data life cycle so that more data can be generated, properly harnessed, and then potentially put to good use. Also, the ongoing evolution of digital technologies and network connectivity via 5G requires diffusion into economies and society so that everyone can gain fair access and benefit equally. Training to up-skill and re-skill workers in the use of digital technologies will also become essential, especially when some jobs are replaced with newer ones created by digital transformation.

Discussion of the emerging performance framework emphasized the importance of the societal level of analysis given the interconnectedness of digital technologies and data at all levels. Digital strategies at lower levels including citizens, businesses, and industries should align with those of counties and even society, more broadly. Equally important, the horizontal view has also shifted; traditional boundaries no longer exist in the digital universe where the physical world is converging with the virtual world. This is due in part, to the proliferation of data that are boundaryless, and digital technologies like the IoT that are increasingly woven into the fabric of society. Moreover, the digital environment presents new opportunities and threats. Examples of potential benefits resulting from digital transformation include increased efficiencies, improved products and services, new job creation, and well-being. Some concerns focus on data privacy, digital access, and digital security.

Discussion of the performance needs across the society level of analysis pinpointed to essential components in plans of action. Digital infrastructure is crucial for not only accommodating communication networks and services and enabling adequate capacity for data storage and processing power, but also permitting the diffusion of data and newer digital technologies as they evolve. Calls for coordination among policymakers, citizens, business, government, and world leaders are growing; coherence between national and international digital strategies, infrastructures, and policies will become evermore critical.

There is no end to the digital age in the foreseeable future. As digital transformation continues to disrupt our world, choices about digital technologies and data that are made now will chart the road ahead and profoundly impact future generations.

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Towards a Unified Theory of the New Market Realities in Cyber-Physical Design Search Spaces

Qeis Kamran, A. Reshani, and S. Topp

Abstract Many trends are shaping the future of marketing theory and the theory of the markets in the contemporary era. These trends are based on the general dominant shifts in value-generating phenomena within markets and the new spaces of convergence within the sociological structures of the markets. The major shifts can be described based on a general and fundamental emerging new reality of an evolution from the atomistic Weltanschauung of value perception of products based on the goods-dominant-logic (GDL) towards a bits and data dominated, ubiquitously interconnected and global market of the contemporary Anthropocene age. In essence, the conglomeration of these developments is found within foundational and structural societal shifts, such as; the developments of artificial intelligence (AI) and data science, a global consumer movement for sustainability, the changing global market requiring a quick response from the marketers and the limitations of traditional marketing science to cope with these new challenges. The chapter addresses these issues and develops a unified theoretical framework for marketing and the new markets in the contemporary era.

Keywords Markets · Marketing theory · Design · Cyber-physical spaces · Service-dominant logic · Co-evolution

1 Introduction

Historical developments within marketing owe much to Alderson, who led a paradigmatic shift within marketing between 1955 and 1975 (Shaw & Jones, 2005). He brought three essential changes within the evolution of marketing (Shaw et al., 2007):

1. Focus from micro to macro distribution.
2. From a purely economic lens Weltanschauung towards a broader integration of behaviour sciences.

Q. Kamran (✉) · A. Reshani · S. Topp
ISM-International School of Management, Dortmund, Germany
e-mail: q.kamran@utwente.nl; qeis.kamran@ism.de

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3. From description and classification towards a theory-building shift within the field.

While historic research into markets conducted by Grether (1976) displayed the lowest interest in historic research, the explosion of this category was experienced in the80 s (Jones & Monieson, 1990). The notion of historicity in marketing is pivotal to academic thought within marketing (Hunt, 2012; Tadajewski & Jones, 2014; Vargo & Lusch, 2004a, 2004b, 2006), thus it paves the way for a better and more fruitful decision-making and foresight in practising and teaching marketing.

While the contemporary amplification of psychographic segmentation with the power of big data and IT has developed a dystopian scenario for the free world of which Brexit and the rise of global populism are the most recent examples, additional, more integrative convergences of markets can be globally observed. The ubiquitous communication and the interdependency of the global markets have created a new type of globalization that is not purely reserved for or driven by notions as outsourcing or offshoring or foreign direct investments (FDIs) from the West to the East, but moreover, it is based on a globalization of totality (Kamran, 2020). This means, markets are shifting towards a more holistic mode of globalization, wherein the globalization of (1) pandemics, (2) radicalization, (fundamentalism of left and right and populism), (3) poverty and racial and economic inequality, (4) market crises (the several global management and financial crises), (5) migration of people (refugee crisis) and (6) ubiquity of information based on the rise of technology are intertwined and are creating more complex global markets. This chapter is written to develop a theoretical foundation for marketing in the age of technicity by incorporating the role of design as a major foundation upon which a path is constructed for bridging traditional marketing theory with the contemporary developments in technology. Thus, the objective is to establish a marketing and managerial theory of integrating AI and the contemporary technological advances and not the opposite, which is a technicity-based theory of value for marketers.

2 Methodology

The methodology of the research is based on the framework presented by the AMS review editorial "*advancing conceptual-only articles in marketing*" (Vargo and Koskela-Huotari, 2020). The model is applied based on the challenges of the shift from an atomistic driven model of production, towards a bit and data-driven market, wherein the foundation of value is based on new dimensions of capital for the global firms in terms of consumer data and the prediction of behaviours based on the algorithmic capacity and habitus of firms. In addition, the limitation of traditional marketing within the complex markets of today is highlighted.

An in-depth literature review, within the dimension of service-dominant-logic (SDL), where one of the original contributors (Stephen Vargo or Bob Lusch are one of the co-authors) is conducted, which the authors regard as the most recent

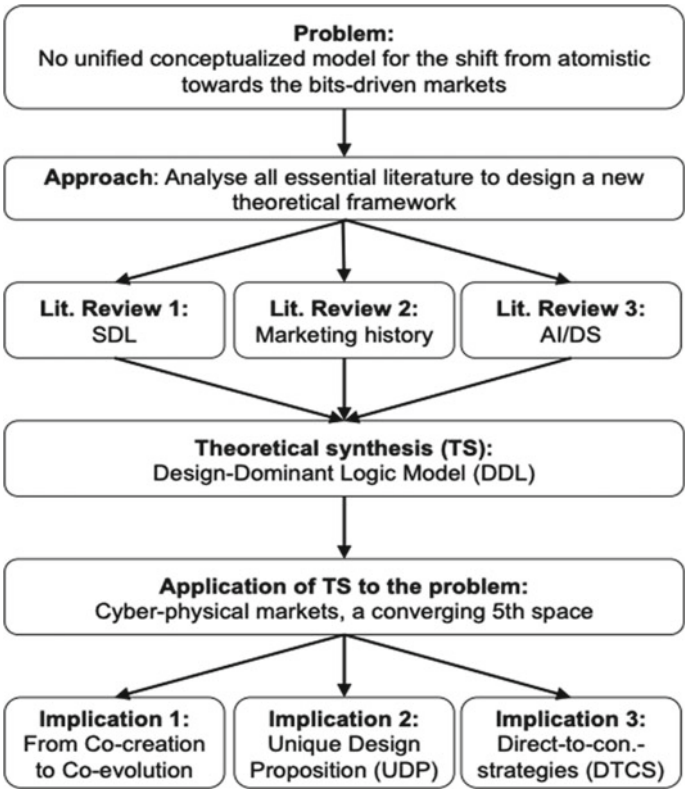

Fig. 1 Methodology

theoretical advancements within the field of marketing. Furthermore, the historical and relevant literature on marketing is considered. An additional in-depth literature review within the most relevant publications within the field of AI and AI and marketing is considered to bridge the gap between these two fields by harmonizing these segmented developments of traditional and AI-driven marketing. The theoretical synthesis is postulated within a new view that may deliver a fruitful foundation for the development of the marketing theory. The implications for practice are given by describing the new cyber-physical market developments and also based on the newly coined *fifth space* of market convergence. Solid examples of these implications are highlighted based on the development of the theory from co-creation towards co-evolution, the notion of the unique design proposition, which is then complemented by solid direct-to-consumer- strategies for the firms.

3 The Field of Marketing: SDL, GDL, Market Theory, and Theory of Marketing—The Emerging New Reality as Evolving Space for Marketing Theory

In general, the locus of innovation within the contemporary marketing theory is based on developing universally valid frameworks on how to relate and establish a bridge of continuity between the changing and growing needs, wants, and desires of a globally hyper-connected and perceptually converging consumers' base in habitus (Bourdieu, 1984, 1985a, 1985b, 1986, 1987a, 1987b, 1985d), their ever-growing mutual socio-political environmental concerns (Hastings & Saren, 2003), rising buying power. Meeting these emerging market developments seems to be very difficult by the tools of traditional marketing. Despite increasing marketing abilities amplified by social media (SM), AI, data science (DS), and the transcendence of marketing from being a main field within business administration evolving towards a field under its own right in digital-humanities with societally transforming powers, traditional marketing concepts in many industries globally have declined on importance in the contemporary era of the "*digital turn*" (DFG, 2020). Because of improvements in the telecommunication and transportation systems and infrastructures, which deliver the foundation for the new cyber-physical-design-search-spaces of individual experiences and firms' abilities to engage in direct-to-consumer-distribution- strategies the way was paved for a much closer relationship between providers and the consumers. Good examples are platforms', apps' and surfaces' economies, in addition, the rise of globally operating mega online retail stores, e-commerce eco-systems, infomediaries, and cyber-physical mega players as *Apple* by being one of the first, going towards a customer intimacy model, then *Amazon*, by opening physical bookstores and the *Amazon Go* food retail chain stores, and now also *Netflix* has gone cyber-physical by re-opening the Paris Theatre in New York.

4 The Emerging Market Complexities

The world of the twenty-first century has been exponentially moving towards a complexity-based paradigm shift, where multiple spheres of realities and Weltanschauungs are converging, thus, resulting in the emergence of a unified phenomenon of a complex reality that has been challenging the existence of many businesses. Traditional marketing has its limitations in establishing an innovative and pragmatic framework within the new hyper-connected and globally intertwined market spheres of cyber-physical realities of today, where service is rendered based on the co-creation of the dynamic capabilities of multiple firms working in concert by designing competing global value chains (GVCs). These spheres of realities are based on trends that need to be identified, unified, and integrated within the sensing capacity and regulatory responses of the firms' navigators, coping with the emerging complexity of today's global markets (Ashby, 1991; Ashby & Stein, 1954). Historiography of this

evolving complexity is illustrated in Fig. 2, which displays the multiple revolutions that our societies had to undergo, and it delivers a solid account of a transition from an atomistic towards a bits-dominated universe, with new rules of the game, where traditional marketing based on the inherited origin and logic may have many challenges to cope with. The major revolutions are a history of man's creativity manifested in form of development phases in the technological advancement as described below:

1. Conquering matter → resulting in man's control over, e.g. fire, wood, water, and stones.
2. Conquering energy → resulting in man's control over energy, e.g. steam, coal, fossil fuel, and nuclear power.
3. Conquering information → resulting in the development of cyberspace, computer science, AI and the world wide web, augmented and virtual realities, internet of things (IoT), and the rise of smart machines.
4. Embracing cyber-physical realities → The emerging new world of cyber-physical realities, where the boundaries between realities divided so far into cyber and physical, would disappear, thus resulting in a shift towards a unified reality, which is essential for firms' survival for operating within the emerging new market reality.

The traditional marketing theories were either developed by capturing the realities within the era of managing the atoms or have been contemporarily designed based on a segmented understanding of the cyberspace marketing reality. This means much development within marketing theory has been done based on the logic of separation in terms of the "*click or mortar*" environments. From a contemporary point of view, doing business within the spectrum of cyberspace is understood as e-commerce or e-marketing within a logic of observing it purely as a "*marketing channel*" or as a different marketing regime. However, many firms, as the examples above demonstrate, exist on highly table and viable grounds physically by having established a solid position in the cyberspace *avant le lettre*. Successful existence from a marketing point of view requires that both worlds are managed ambidextrously.

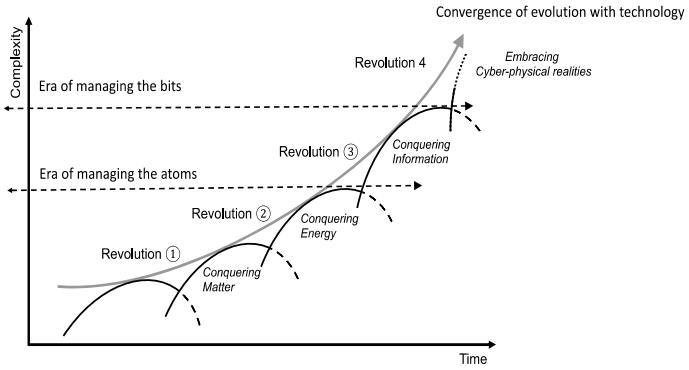

Fig. 2 The revolutions of marketing

Except for SDL (Vargo & Lusch, 2004a) the development and the influence of the Nordic school of marketing (Gummesson et al., 2012), defining the history of the challenged hegemony of mass-marketed consumer goods, the inherited logic of marketing draws back insights from the industrial, if not the pre-industrial age. While e-commerce and e-marketing theories have developed much in separation of the traditional marketing advances, they are based on different logics, models, and job titles, where traditionally developed theories of marketing have been absent in influence, rigour, and impact and where the trained marketer within the foundations of "*business administration*" (BA) has many struggles to offer a solid contribution to the vocation of the *emerging marketing technologist* and the research scape of this digital transition (Swaan Arons et al., 2014; Brinker & McLellan, 2014; Gummesson et al., 2012). Marketing theories valid within the contemporary era of the "*digital turn*" are the results of developments in computer science (CS), data science (DS), artificial intelligence (AI), machine learning (ML), deep learning and concurrently enhanced by augmented reality (AR), virtual reality (VR) and IoT technologies, thus resulting to a new type of marketer as the *marketing technologist* (MT) (Brinker & McLellan, 2014), whose managerial mindset has not been trained by the inherited logic of marketing within the tradition of economics and exchange theories, but moreover based on information sciences (IS) and towards an evolving co-created modus operandi of the exchange model. The integration of the economics' lens has been the foundational Weltanschauung, whereupon the fields of BA and in particular marketing have observed the societies, and hence, a shift has been emerging (Swaan Arons et al., 2014), in as far as the spectrum of the contemporary applied economics drawing back to the Austrian school and the Chicago schools propagated neoliberalism (Harvey, 2005), seems to be insufficient for the emerging cyber-physical systemic realities of today's network economy.

The emerging symbiosis of the co-evolutionary phenomenon of technology within advanced societies has awakened a sustainability-conscious consumer base, who observes the many do-gooding endeavours, e.g. philanthropy and corporate social responsibilities (CSR) as outdated models (Kramer & Porter, 2011), and which would need a logical replacement by more all-embracing scientific foundations and philosophies, and which would not call environmental concerns as mere externalities and who must be attracted by a shift towards the globally operating firm's soft-power (Nye Jr, 2004) and a better firms' foreign policy. "*Such a policy will have two goals: to improve a company's ability to operate in foreign environments through effective corporate diplomacy, and to ensure its success wherever it is engaged through careful geopolitical due diligence*" (Chipman, 2016). The crisis of Dieselgate did not hit Volkswagen (VW), because of the lack of ambition of smart people at VW designing shallow analyses, but the crisis rather has evolved because of a mixture of diversely uniting misconceptions within the design of VW's foreign policy for the US market. Some examples are the linearity of how culture and different societies are treated within the preparations endeavours of leaders sent abroad by an intra-company "*illusio*" about the world, wherein they operate and the theories that dominate markets' behaviour and competition and a marketing theory, that embraces economic viability as the ultimate test of a firm's successes and the calculation of a

quantified probability and impact analyses that has major flaws within the design of the parameters, upon which it was based.

Marketing theory, therefore, by the necessity of the age and the opportunity at hand needs to provide an answer to the new emerging dimensions looming large to be dealt with, thus by civilizing capitalism in terms of laying the grounds for a better socio-environmental symbiosis as a new social contract within the overall relations of firms and the globality of the intertwined markets. Here, we as marketers have a solid opportunity for impact and a much-needed change in our managerial mindset of the field. Marketing has topologically arrived within a pivotal moment of its development and needs a solid self-reflection. Hence, amplified by the rise of exponential technology, it is at a unique position of acclaiming an all-embracing raison d'être and be a guiding light that contributes towards aligning the world and making this special moment a pivotal point of its development towards a new turn, observed by lenses of the human side of marketing within the age of Anthropocene.

In this age, firms globally need to respond in real time to emerging complexities, operational challenges, product returns and recalls, and diverse PR crises, which directly affect the firms' marketing success. A vital transcendence in the habitus of a marketer is also needed, thus, to recognize that not only the wide-spread theories in marketing mainly founded within the science of economics and later in psychology may need ontological and pragmatic revisions for the emerging new converged world of the cyber-physical market reality.

Figure 2 describes the dominant trends that are influencing marketing today. Peter Drucker has observed: "*The greatest danger in times of turbulence is not the turbulence; it is to act with yesterday's logic.*" (Drucker, 1993). Figure 2 captures the dimensions of a more holistic model of realities, which needs to be embraced by marketing theory to deliver a solid foundation upon which marketers can design effective strategies for sustainable future growth and development within the mutual sustainability of the firm and market symbiosis.

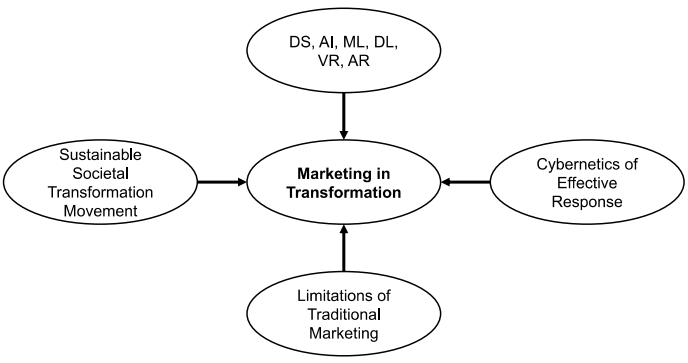

Fig. 3 The transformation of marketing

5 Bartels Topologies

While from Bartels (1951) account of the marketing reality between 1900 and 1923 almost a century has passed, the three foundations upon which he had derived his historical analysis are still valid points of departure, as "*youthful experiences*", "*academic stimulus*" and "*occupational demands*" are continuing to be challenged to be dealt with by marketers and which still are solid defined beaten-tracks for developing marketing's emerging new identity within the cyber-physical spheres. Bartels observations could be superbly aligned with the authors' derived model of the trends affecting marketing. Thus, youthful experiences have been amplified to be more within the possibilities of the cyberspace, and while in Bartels time, they did not produce immediate results and were passive conditions for stimulating and affecting frame of references of a marketing inquiry, which took place later, however, the reverse is happening today. Youthful experiences have been the foundational cornerstones of marketing within the digital and AI era. The dimension of academic stimulus in terms of teaching and learning is a vital point that has also shaped the essential developments within the theory of marketing such as SDL (Vargo & Lusch, 2004a). The third dimension of occupational demands has been an area, where much progress has been made so far but more development seems to be necessary, in the realization of which this chapter has been written. As a teaching faculty of marketing, by addressing and teaching both and still separate spheres of marketing within the rising gap in traditional and digital methods, a necessary foundational need has been emerging within the students' and class' discussions with the undergraduate and graduate-level students for a more aligned theory and frame of reference in marketing, which still is thought in a duality. While traditional marketing covers the vanishing world (Beer, 1975), and the new world of complexification has been left to the latter branch of e-marketing with yet a logical foundation to find. To respond to this emerging new reality and the realized marketing needs, the chapter develops a theoretical framework that would deliver a foundation for aligning the evolved duality within the field towards a unified framework of a market theory.

6 The Evolving New Converging Class in Habitus Coined as the Fifth Space

Observing markets from a cultural-economic perspective, three strands are part of widespread activities in the study of economics (Berndt and Boeckler, 2010): (1) market conceptualization as heterogeneous arrangements of people, things, and sociotechnical devices; (2) the insight that multiple frames of reference are mobilized in market activities as an addition to instrumental rationality; (3) approaches that combine diversity and difference in concrete market contexts with attention to mobility in network capitalism. While, income-inequality is globally rising "… *the dynamics of wealth distribution reveal powerful mechanisms pushing alternately*

toward convergence and divergence…, and there is no natural, spontaneous process to prevent destabilizing, inegalitarian forces from prevailing permanently." (Piketty, 2014) and populism amplified by social media has created a sense of much separation of class and race within the diverse fabrics of societal classes of the global societies, in contrast to these developments a new type of unified and converged emerging societal order has been sensed. This convergence is shaped by an evolving habitus of this generation stimulated by the possibilities of the ubiquitously connected global world. According to Bourdieu (1984b): "*The habitus is not only a structuring structure, which organizes practices and the perception of practices, but also a structured structure: the principle of division into logical classes which organizes the perception of the social world is itself the product of internalization of the division into social classes. Each class condition is defined, simultaneously, by its intrinsic properties and by the relational properties which it derives from its position in the system of class conditions, which is also a system of differences, differential positions, i.e., by everything which distinguishes it from what it is not and especially from everything it is opposed to; social identity is defined and asserted through difference.*" Many of Bourdieu's insights still hold, however, within his identified conditions of existence of habitus and "*culture capital*", based on the contemporary technological developments and possibilities within the digital turn of the cyberspace, a fifth space of distinction of values, tastes, preferences, concerns and structuring dominant structures of judgement spheres have emerged that aligns the differences by a set of values that cannot be distinct by class nor by social status or ethnicity. An expensive fur coat, or a lion-hunting expedition, was once observed as a superb display of aristocracy and social class, which were totally accepted and expected behaviours in some Bourdieusian fields, but which are both regarded today as animal cruelty. While we agree with Sissors (1966b), as "*markets are people*", that the nature of market is more than the generic class of products, the eight descriptive classifications, which Sissors distinguished by defining a market as: (1) size of the market, (2) geographic locations of purchasers, (3) demographic description of purchasers, (4) social-psychological characteristics, (5) reasons why products are purchased, (6) who makes the actual purchase and who influences the purchaser, (7) when purchases are made, and (8) how purchasing is done, may be challenged, within the fifth space.

In today's emerging markets, an ill-judged twitter-feed can cost many celebrities, politicians, and even elite academics losing their positions and the vital sources of social and academic capita; a viral online video of an employee's treatment of customers, can drop the stock value of the firm significantly, and while the training of taste in arts and culture, which once was acquired with many investments, can be obtained today by the enormous possibilities of the online education by semi-paid or freemiums, making this acquisition possible with less cost to capital and opportunity. Furthermore, the distinctions of class, taste, and judgements, which once evolved because of the boundaries of a general lack of access to sources of capital within the lower echelons of the societies (Bourdieu, 1985b, 1985d), are disappearing, hence creating a new space of inclusion, not separation of an emerging new fifth space within the markets. Marketing, today, can be regarded as a foundation of enhancing the human condition and should not waste this opportunity. Marketing is beyond

selling because it is the part of the organization that ensures viability for the long run by relating the firm to its wider and adequate environment. Hence, the service lens tends to broaden the perspective of exchange and value creation by implying that all social and economic actors engage mutually in value creation (Vargo and Lusch, 2011). Marketing is the organizational function that creates and ensures the conditions of existence of the firm and the societal well-being within the resonating back and forth loop of a meaningfulness recursion between the acting stakeholders. Jeff Hammerbacher the once co-founder of Facebook underpins: "*The best minds of my generation are thinking about how to make people click ads*", thus, marketing is more than that (Vance, 2017). Within this new space a unified and a non-zero-sum co-creation and mutually gaining convergence of taste and judgment based on the foundational shifts that have been realized in the holism of access to better education, access to ubiquitous cycles of information, a rising buying and bargaining power-driven by social-digital currency, and co-evolved by a new type of brand behaviour and brand raison d'être, which gives equal access to all actors embedded in the four previously defined but separated fields by Bourdieu. The new iconic brands are mega actors such as *Google, YouTube, Netflix, Apple Inc., and Amazon, Zara, Facebook, Instagram or LinkedIn,* etc., regardless of the buying power or the social class they are either freemium services or semi-freemiums, contributing towards some sort of new form of capital within the digital space. A good example here is, not the sold concert tickets of an artist, which matters, but the number of "*views*", "*likes*", "*ubiquitously globally trending content*" *and* "*shares*", which are the dominant forms of capital emerging today. In addition, the previously mentioned brands are available to almost all social classes, thus redefining, what once was observed as "*the brand marketing for the few*" to a new situation of "*a brand experience of all*". As the level of education is rising and different business models even in education institutions are emerging, not only because of the possibilities that the MOOCS offer, but moreover more students are joining top schools in Europe from China and also US, where access to education is mainly available for free. Computer science schools as *42* in France and now also in Silicon Valley or *Code University of Applied Science* in Berlin, Germany have evolved based on the necessity of the markets, to offer free or much attractive tuition payment options, by the modus of the co-creation principle between multiple stake-holding entities that have founded these schools, enhance further the dimension and growth of the new fifth space. The model of these universities is accessed on merit not social privilege.

Figure 4 describes the fifth space of a converging societal sphere, which needs to be addressed not only by the distinction of taste and judgement but moreover by the unification of habitus, perception, and socio-political awareness and concerns. According to Bourdieu (1986b): "*The convertibility of the different types of capital is the basis of the strategies aimed at ensuring the reproduction of capital … by means of the conversions least costly in terms of conversion work and of the losses inherent in the conversion itself…*" (p. 253). This convergence amplified by ubiquitous technological possibilities has created a market space, where it embraces the integration of the most sustainable ideas and characteristics beyond the previous segmented hierarchical market playgrounds to which Bourdieu, referred to as: "…

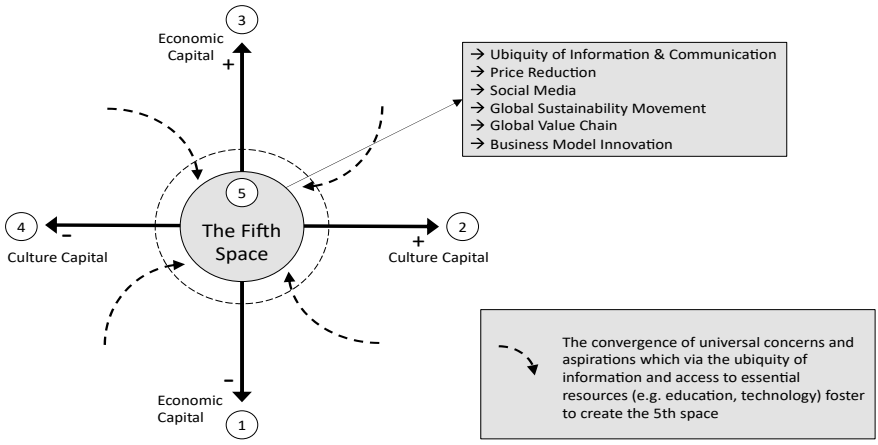

Fig. 4 The fifth space

in the sense of illusio, belief, an involvement in the game which produces the game" (Bourdieu, 1986b, p. 86). The digital turn has produced a new culture that can only be understood by the marketer entering this culture, it is not a top-down or bottom-up approach but rather a "*market- within*".

"Culture is a stake which, like all social stakes, simultaneously presupposes and demands that one take part in the game and be taken in by it; and interest in culture, without which there is *no race, no competition*, is produced by the very race and competition which it produces" (Bourdieu, 1984b). The culture of the digital space redefines the logical function of capital in terms of not only the economics but moreover within the dimensions of the "culture capital" as systematically structured by Bourdieu, "… as the long-lasting dispositions in the mind and the body" (Bourdieu, 1986b). The authors are not purely referring to the emergence of a social media amplified popular culture but are giving attention to the fifth, but a foundational shift in terms of a new social space of an emerging dominant market in terms of capital and market dynamism beyond the segmented lens. To succeed within this emerging socio-cultural space, the mechanism of control and reproduction and the understanding of behaviour within this social space would be essential for the development of market theory within a global context.

7 Service Dominant Logic: An in-Depth Analysis

The revolution in service marketing (SM) to converge goods-dominant logic (GDL) with service-dominant logic (SDL) was a necessary step in evolving towards a new logic of marketing, thus advances made by service scholars have provided a foundation for a more service-oriented view of all exchanges from which more appropriate normative strategies can be developed for all of marketing (Vargo & Lusch,

2004a). The four myths of service marketing (intangibility, inseparability, heterogeneity, and perishability) do not distinguish services from goods; thus, they only have meaning from a manufacturing viewpoint and imply inappropriate normative strategies. The demystification of these four myths towards a new normative strategy has paved the way towards evolving marketing theory to a new and more robust foundation by a redefinition of the notion of service within a much suitable logic for marketing in terms of service, as the holistic phenomenon of market relations. The necessary implications from a multiangle perspective have been established with much broader implications for marketing theory, practice, and pedagogy towards solving macro societal challenges in general management and public policy (Vargo & Lusch, 2004a). Thus, the inherited GDL based on the exchange model that focused on tangible goods is challenged by the new defined dimension of what "*service*" implies within SDL, hence this emerging perspective is focused on intangible resources and the co-creation of value with the customer. Therefore marketing, in essence, is the provision of service to be rendered or doing a job that occurs in the lives of some sorts of consumers (Vargo & Lusch, 2004a; Christensen, 2016a, 2016b; Christensen et al., 2016). A vital insight within this shifting paradigm was to see the locus of innovation within the field of marketing by enhancing the understanding of service provision towards a unique foundation and a change from the exchange mode of market relationships towards a co-creation mode of value generation phenomena (Vargo & Lusch, 2004a). Vargo and Morgan (2005) suggest that the service-centred model of exchange is pivotal for the advancement of the understanding of exchange relationships in marketing. Thus, a service-focused mode of exchange is vital to understand how relationships between actors within a value chain (VC) could be understood more precisely (Vargo & Morgan, 2005). The shift within the field of economics that focuses on the production and distribution of goods has been challenged by a broader logic that SDL has provided, hence the ubiquitous transmission of information and export of skills beyond topological and time-zone boundaries provides a much better understanding of the societal shifts that could be better observed and coped with via the SDL (Lusch et al., 2006). Vargo and Lusch have clarified the diverse essential themes of why it is necessary. SDL, therefore, is indicating a process of doing something for someone (Christensen, 2016b), rather than the plural general observation of the notion "*services*" in contrast to goods. In SDL, service is the common denominator of exchange and thus is hypernymic to goods. There are no goods-versus-service winner or loser in SDL. The integration of this view has established service beyond the understanding of services in lieu of products (Vargo & Lusch, 2006), but as the foundation of value that a produced artefact renders. In addition, the notion that economic entities are better observed as service integrators gives a more solid conceptualization of designing global value chains (GVC) and relational webs of multiple firms via their application of dynamic capabilities and organizational ambidexterities by dissolving the challenges of core rigidities, which have emerged from a linear model of the GDL modus operandi of marketing. This also means that we need to set the competition apart as broadly defined within the Porterian logic (Porter, 1979), which has observed customers and suppliers as actors with whom a never-ending zero-sum game is played, also coined as "*competitive strategy*".

General theories are long in coming to an academic discipline. When developed, they come under extreme scrutiny. However, Lusch and Vargo (2006) do not propose that SDL at its current stage of development is a general theory. Nevertheless, for the reasons established so far, it provides the foundational basis for the development of a general theory in marketing (Lusch & Vargo, 2006). SDL is a shift in logic in the real sense that emphasizes activities driven by special competencies, knowledge, and skills, a pivotal role in exchange processes, and a paradigm shift in marketing logic and not a replacement of one form of output (Lusch & Vargo, 2006). In the logic of Alderson (1957), SDL establishes a marketing interpretation of the whole process of creating utility by holistic definition of service. The integration of service in terms of specialized competencies (knowledge and skills) to deliver value to another entity or for the entity itself are the necessary recursive conditions, which is essential to avoid marketing myopia today (Lusch et al., 2006).

8 Services Versus Goods (SDL vs GDL)

While SDL defines the dimension of how service as a process can be conceptualized, rather than seen as a mere unit of output, it focuses on the integrative dynamic of resources and core competencies beyond static integration of resources (Lusch et al., 2008). According to Normann (2001, p.114): "*Services are activities (including the use of hard products) that make new relationships and new configurations of elements possible… Viewing the economy as a web of activities and actors linked in co-productive value creation gives us another*". Michel et al. (2008) underpinned Norman's notion of value creation based on the co-creating dimension of customer's involvement within the value-producing domain of offerings based on a resource integration of operant resources. The inherited duality of product vs. service debate, wherefrom a transition within the dimension of GDL considers that production should be modified in a way to distinguish the differences between goods and services. SDL, in contrast, focuses on using the core competencies of the stake-holding parties for the benefit of one another as the foundation of economic exchange, thus there is a vital need for revising the whole logic of marketing from a service-driven post-GDL structural Weltanschauung.

Maglio et al. (2009) observe that SDL is a proposition of abstraction for the twenty-first century, wherein an emerging revolution of thought regarding the enterprise and economics is based. The Weltanschauung of SDL, thus, is a strong contrarian view of the vanishing world based on GDL. Within SDL as a system and platform of service, whereupon a configurable integration of diverse operant and operand resources can be paved to interact with an additional value-creating network of systems, thus *Apple's AppStore* or the *iTunes, Netflix or Uber, Airbnb* are the firms which rose against the tide by challenging the status quo within the boundaries of forward-pushing marketing myopia, hence it was not the CD, or the observation of what the utility function of a phone was or that neither a DVD nor a blue ray system was the endpoints of evolution there, nor the linear TV, but what actually was the service or the job

to be done, which have defined winners and losers. Managers and employees can distinguish, how service provision and the process of brand value creation can be established either directly or via the artefacts produced (Merz et al., 2009), hence the value of *Netflix or Instagram* is based on the "*value in use principle*" and "*co-evolution*" via "*direct-to-consumer-strategies*" by the behaviour and the interaction of the actors of which the firms have a precise map of the histography of actions, likes, and views. Being on *Netflix* is not pure entertainment, it goes beyond that, as metaphorically it may enhance small talk capacities; how else can one understand and even participate in jokes that may refer to them. It is has become more expensive co-evolutionary not to be on it than to pay the minimum amount that it requires.

Based on the advance of a network economy, customers engage as co-creators of the firm's marketing initiatives. Firms are advised to foster this shift and see it as a part of a virtually networked market economy. Hence, the dimension of the in-bound marketing is better embraced in terms of efficiency, effectiveness, and more complete by integrating customers as partners that firms "*market-with*" and "*co-create*" value beyond the Porterian logic of seeing customers as forces, which has been the foundational premise of the SDL (Lusch & Vargo, 2009). SDL also delivers a much wider meaning for the network theory Weltanschauung, wherein an extended dimension of interconnectedness and co-dependability of actors is described. Holistic and actualized marketing embraces the notion of value co-creation via service for service exchange by the resources integrating actors (Vargo, 2010), and hence, markets are complex systems, which can be better observed as configuration for co-created evolving value provisions (Vargo, 2011). Markets are furthermore defined within the boundaries of the three recursive levels of micro, meso, and macro relations, wherein ubiquitous exchanges take place (Chandler & Vargo, 2011). With the foundations of SDL, a broader perspective of exchange and value-creating processes has been established and the notion of B2B as a general rule within marketing, thus as a transcendence towards an actor-to-actor (A2A) orientation, which delivers a solid ground for a dynamic, networked and system-oriented understanding of value creation is paved (Vargo & Lusch, 2011). These direct-to-consumer relationships have been responsible for the development of the most iconic brands and firms' success stories, such as *Amazon Go, Amazon* bookstore, *Amazon Prime*, *Apple AppStore, iTunes, Apple* + , *Netflix*, and older firms jumping on new promising ventures as *Disney* + and many more. While, SDL is to be seen as a Weltanschauung and not as a general theory for marketing (Vargo, 2011), thus constructing on Hunt (1991): "*a systematically related set of statements, including some lawlike generalizations, that is empirically testable*", are needed to enhance the theoretical contribution of SDL and its implications for defining markets in the future. The complexity of markets is described by the notion of analyzing markets as configuration and systems of unique value proposition (UVP) that enhance value co-creation (Vargo, 2011).

Based on bridging SDL with structuration theory deriving from sociology, it delivers a theoretical framework, whereby three service dimensions could be aligned. (1) A unique value proposition (UVP); (2) by inviting actors in a mutual service-centred engagement, as alignment of connections and tendencies and (3) the notion of *experience innovation in a many-to-many* basis (Chandler & Lusch, 2015;

Gummesson, 2004). Furthermore, SDL is founded within the four definitions of UVP: (1) value is phenomenological, which means, it is meaning driven, (2) value is based on co-creation of a web of actors within evolving meaningfulness that resonates back and forth in feedback loops, (3) value is holistic and therefore the economics and the price-driven notion of transactions and mass-industrialization is outdated, and (4) value is an emerging phenomenon, thus value is a co-evolving creation of meaning and value beyond the resultant and predictable planning paradigm that guided management and strategy for such a long time.

Based on the service ecosystem approach, an enhancement of the service marketing research paradigm is proposed, thus service is the foundation of all exchanges in terms of the concept of value in use, which can be regarded as all service encounters are service experiences and that this dimension goes beyond the physical, social, and relational boundaries by integrating the diversity of institutions in a socio-historic context (Akaka & Vargo, 2015).

Value co-creation is generated via organized *actor-to-actor* (A2A) *structures* within a value chain (Vargo & Lusch, 2016). Hence, new resources could emerge from a conflicting view that co-exist within an organizational setting, which may contribute towards the generativity of resources' transcendence (Koskela-Huotari & Vargo, 2016). So far SDL has delivered a framework of evidence-based research for strategy development and execution, the application of complexity and cybernetics Weltanschauung within economics and heuristics for complex service-centred ecosystems form a holistic perspective that aligns ethics, economic, environmental, and social sustainability, and public policy (Vargo & Lusch, 2017).

9 Market Theory and Theory of Marketing

SDL could be regarded as a marketing interpretation of the whole process of value creation (Alderson, 1957), hence, specialized core competencies are applied to mutual symbiotic win–win relationships. An evolving complexity-based paradigm based on the potential of SDL has evolved, wherein Lusch (2006) argues that macro-marketing research should start with an understanding of the most micro-actions of buyers, sellers, and governments (Bartels, 1951). The complexity, which is based on the agents and their micro-actions results in the emergence of macro-structures, which take a long time to emerge and then evolve further over long periods. Hence, there is a recursive dimension of structures constructed by the activities of multiple agents that emerge into the macro-structures in a long-term period. Granovetter (1973) observes: "*A fundamental weakness of current sociological theory is that it does not relate micro-level interactions to macro-level patterns in any convincing way. Large-scale statistical, as well as qualitative studies offer a good deal of insight into such macro phenomena as social mobility, community organization, and political structure*". The authors would come back to the notion of co-evolution later within this chapter. The alignment of the inherited duality existent between products and service serves as a cohesive foundation for an understanding of this phenomenon

as the holistic notion of observing value and meaning within the logic of service that co-created artefacts that transmit to the consumers (Vargo et al., 2017). SDL has also been observed as a tag that is used to identify what appears to be an evolving revised logic of the notion of exchange for market theory and marketing theory in general. At the same time, it is appropriate to investigate SDL empirically at any point in this evolution, while premature conclusions should be avoided (Vargo, 2007). In addition, there is no inherent reason why marketing science must solely rest on the back of economic science. Of course, there is also no inherent reason why SDL should not do the same or enhance its logic towards more suitable sciences. Furthermore, there is no reason why marketing science, or more precisely market science, cannot develop its own positive theory and contribute not only to the further development of more adequate normative marketing theory but also as a positive theory of enhancing economics (Vargo, 2007). This of course amplifies Alderson's (1957) call for "*a marketing interpretation for the whole process of creating utility*" and meaning within the co-created and co-evolved realities of the cyber-physical age. Marketing has grown out of the foundational logic of pure economics (Vargo, 2007), and hence the same logic appears to be applying also to SDL because there is a need for developing a self-sustaining methodology beyond a positivistic lens for the field, which is also the pursuit of this chapter. To illustrate the gap in the field that could be fulfilled based on a design Weltanschauung and hence answering Dixon's (1990) observation that "*the task of responding to Alderson's challenge remains*" (Vargo, 2007), an enhancement of the notion of SDL to a design-dominated logic (DDL) will be paved at a later stage of the chapter.

10 The Future of Marketing with Elements of AI

The service-transcendence as a pre-theoretical nudge towards a paradigmatic shift in the field has created a solid basis within the topological evolution of marketing's modus vivendi bending towards pure technicity. Based on evidence-based research within the evolution of SDL, the challenge of a unified theoretical model that can be empirically tested is emerging, which with the merits that SDL has triggered, may offer a framework of modus operandi, that would be highly beneficial to marketing theory and theory of markets as possible evolutionary developments. Thus, SDL postulates a philosophical conceptualization of value—*"a change in the viability of a system"* by capturing the nature of value through four essential propositions: (1) value is phenomenological, (2) value is always co-created, (3) value is multidimensional, and (4) value is emergent. SDL provides specific foundations for how future scholarly work can contribute to the further refinement of the understanding of value (Vargo et al., 2017).

The foundational premises of SDL delineate a market-based framework of a service eco-system, wherein actors are influenced by mutual resource integrations based on service-for-service exchange. Here, the integration of systems theory and the *model-based-management* (MBM) amplified on the technological progress underpin

the essentiality of a web of actors and organizations (Vargo & Akaka, 2012). As the world evolves in complex interdependencies, it is more important than ever to pay special attention to service system resiliency and sustainability. The emergence and growth of SCM and GVC within the SDL encourage system-level thinking and provide at least some initial guidance on developing appropriate "*mindsets*" and skills. In turn, this provides the means to be more innovative in developing solutions to "*wicked problems*" (Rittel & Webber, 1973) of man that growing complexity brings forth (Lusch & Spohrer, 2012). Hence, marketing requires a new Weltanschauung to effectuate its vital role in creating a sustainable competitive advantage and to extend the lens of designing a topology for marketing beyond the notions of offerings and the enterprise as an island, the mainstream practice of marketing must be observed via the service glass (Bettencourt et al., 2014).

11 Impact of Artificial Intelligence (AI) on Marketing Theory—General AI

The history timeline of AI is a very interesting journey consisting of major developments in its relatively young history. A rare mixture of knowledge of the basic physiology and function of neurons in the brain, a formal analysis of propositional logic from Russell and Whitehead, and Turing's theory of computation produced the very first work that is now generally recognized as AI, which was done by Warren McCulloch and Walter Pitts (1943) (Russell & Norvig, 2002). However, the birth of AI officially happened in 1956 at Dartmouth College in Hanover, New Hampshire during a summer workshop organized by John McCarthy, Claude Shannon, and Nathaniel Rochester (Russell & Norvig, 2002). Considering that the field was newly invented, the expectations were high, and the early years of AI were full of successes. Given the availability of technology and computer at that time, it was astonishing whenever a computer did anything remotely clever such as simple arithmetic and mathematics. As developments took place, difficulties arose as most early programs were not fully capable of their subject matter and the intractability of many of the problems that AI was trying to solve (Russell & Norvig, 2002). The problems that had arisen were of a general-purpose search mechanism trying to string together elementary reasoning steps to find complete solutions. These systems were known as weak methods since they were incapable of scaling complex problems. In 1969, Feigenbaum, Buchanan, and Lederberg teamed up to solve the problem of inferring molecular structure from the information provided by a mass spectrometer. As a result, they created the DENDRAL program (Buchanan et al., 1969). This program was the first successful knowledge-intensive system derived from large numbers of special-purpose rules. Even though many developments in the field of AI had taken place already, it was the year 1980 when AI was established as an industry and boomed from a few million dollars to billions of dollars in 1988, due to large investments that were being made by hundreds of companies around the world in building expert

systems, vision systems, robots, and specialized software and hardware (Russell & Norvig, 2002). Another milestone that cannot be ignored is the re-development of the back-propagation learning algorithm in 1969 by Bryson and Ho (McClelland et al., 1986). This reinvention marks the return of the neuronal networks, which are massively used today. The revolution in the content and methodology of work in AI enabled the field to advance rapidly and dribble past various fields and industries through innovation and development at an unprecedented rate (Russell & Norvig, 2002). With the help of improved methodology and theoretical frameworks, AI was able to arrive at an understanding in which neural nets can now be compared with corresponding techniques from statistics, pattern recognition, and machine learning. These advancements in the field paved the way for the emergence of data mining and other AI subfields. Similar but more gentle, revolutions have occurred in robotics, computer vision, and knowledge representation where a better absorption of the problems and property complexities through mathematical sophistication has led to more robust methods. Furthermore, the emergence of intelligent agents in the mid-1990s marks another major milestone for AI as the work of Newell, Laird, and Rosenbloom on SOAR is the best-known example of a complete agent architecture (Rosenbloom et al., 1993). Despite these achievements, some heavyweight influential founders of AI, including McCarthy (2007), Minsky (2007), Minsky et al. (2004), Nilsson (1995, 2005), and Beal and Winston (2009) argue that AI should put less emphasis on creating ever-improved versions of applications that are good at specific tasks like car driving, chess-playing, or speech recognition. Instead, they encourage AI to go back strive for Simon's words "*machines that think, that learn, and that create*" (Minsky, 2004). This effort from the heavyweights is called "*human-level AI*" (HLAI) and aims to increase the knowledge base of computers, especially now with the availability of very large data sets, so that humans and computers and work with each other in a complementary way (Fig. 5).

A solid contribution to incorporating AI and establishing a bridge with marketing was provided by Gentsch (2018). The application of the derived insights from the multiple case studies and examples therein have pointed out the essential role of AI, and algorithmics played in optimizing the automation of production, logistics processes, administrative planning, and even the journey of creative procedures of designing within marketing sales and management (Gentsch, 2018). Advances in big data, IoT, and social media are the additional major foundations on which a bridge between marketing and AI must be established on solid grounds (Gentsch, 2019c, 2019e). Furthermore, the notion of neuronal networks and approaches of subsymbolic AI that dominates the marketing of today are essential fields of research that will dominate the developments of marketing theory and research for a long time (Gentsch, 2019b). As marketing needs to come to intelligent conclusions (Gentsch, 2019a, 2019b, 2019c), the first approach of defining the rules would be "*Good-Old-Fashioned Artificial Intelligence*" (GOFAI), a term coined by the philosopher Haugeland (1989), which claims that all intelligent behaviour can be captured by a system that reasons logically from a set of facts and rules describing the domain. Furthermore, the essential role of natural language processing (NLP), which uses pattern

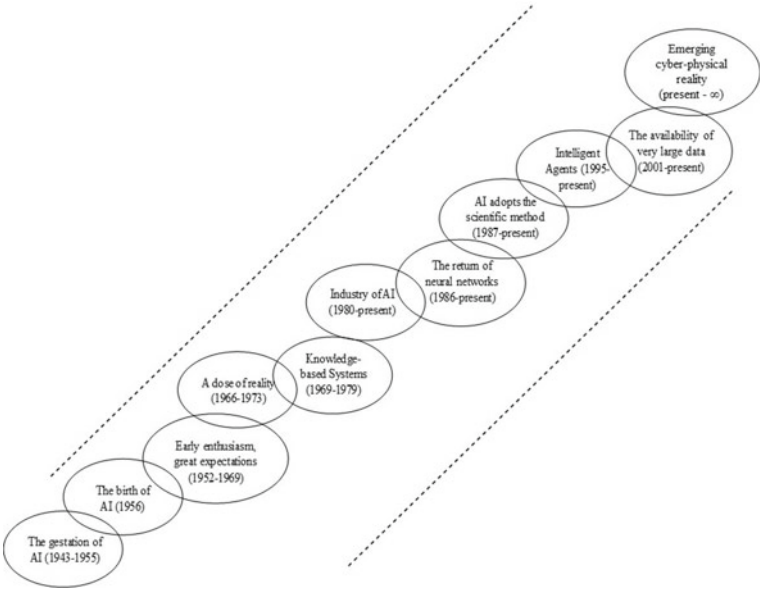

Fig. 5 The history of AI from its inception to present. *Source* Russell and Norvig (2002), extended by the authors

matching and substitution methodology to give canned responses in making man–machine interaction possible in a "*Turingian sense*" cannot be ignored. In a world wherein unlimited information on unlimited computers are available, and where ultimate decisions are generated based on real-time processes and controlled objectively, is perceived to be the future world where a bridge of symbiosis for the fields of AI and Marketing can be paved (Gentsch, 2019a, 2019b). The role of AI and ML is of a high significance in marketing and has revolutionary capabilities on a firm's marketing strategy (Sterne, 2017). This does not imply that marketing professionals should fully rely on algorithms and ML techniques to gain a competitive advantage, however, their engagement is crucial as they need to pursue four paths for the algorithms to perform (Pradeep et al., 2018) (Fig. 6).

To achieve a satisfactory level of product innovation and significantly improve processes in a firm, AI smart machines should work alongside people in a complementary way for each other similar to the way Amazon and Google work (Davenport and Michelman, 2018). AI experts predict that dramatic changes and developments will take place as a consequence of China's continuous increasing pace in its AI development journey. Many jobs will be affected as a result of enhancement (Lee, 2018). Furthermore, additional major concerns regarding AI's rapid development are raised as AI could match and then surpass human intelligence (Barrat, 2013). Thus, indicating that we may be forced to compete with a rival more cunning, more powerful, and more alien than we can imagine. However, the essence of AI from

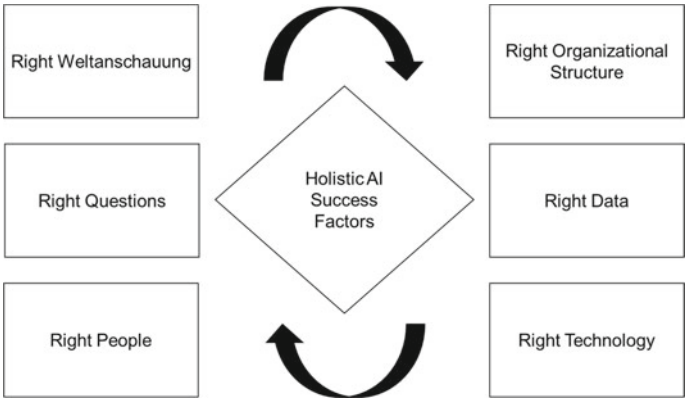

Fig. 6 Holistic AI success factors

a marketing lens is to be able to solve simple and complex problems in different markets, wherever technology is used and applied (Luger, 2005).

To identify whether machines are capable of thinking, we must first find a simple idea to replace the word "*think*" and point out specifically which machines should be considered (Turing, 1980). AI agents are redefining the roles and rules of the marketing game by improving simple and complex marketing activities constantly. The progress that has been made in agents such as "*Virtual Personal Shopping Assistants*" (VSPAs) is tremendous as they are now capable of recognizing consumers' tastes and preferences, predicting their needs, and optimizing their product purchases (Forrest & Hoanca, 2015). All these developments are technologies and are essential developments that would define successful marketing in the current century.

12 Developing New Markets

A new interface-based paradigm fostering human–computer symbiosis via interactive and smart interfaces, creates the effect of a three-dimensional world in which the user can directly interact with virtual objects, thus, forming a "*virtual reality*" (Bryson, 1996). The strong sense of virtual reality and its three-dimensional presence has created the illusion of a new single market in which unlimited computers are available, technology is mature, unlimited information is shared, and unlimited data is gained. The physical world of raw materials, resources, goods, and services continues to exist. In addition to it, the virtual world of cyberspace induced by an increase in electronically networked information systems has emerged and created new bridges and opportunities between different markets, fields, and industries (Weiber & Kollmann, 1998). The virtual market in cyberspace in which information is processed and utilized, and virtual value creation chains are brought within data networks can be referred to as marketspace (Rayport & Sviokla, 1994). Hence, implying that the

marketplaces in which virtual transactions take place, the marketspace is considered an artificial or intangible market for information. Therefore, the creation of a marketspace in cyberspace makes it necessary for firms to reconsider their views on value-creating measures as the significance of virtual value chains in the marketspace for competitive successes in information-based markets cannot be viewed in the same way as the one in physical markets (Weiber & Kollmann, 1998). In the future, a firm will be able to generate consumer value through virtual value-adding in the marketspace (Fig. 7).

New demands have arisen for firms to remain competitive due to a shift towards cyberspace where information is at the centre of this structural change in market systems (Weiber & Kollmann, 1998). The use of information through various digital data paths has become vital for businesses in an attempt for value creation and remaining competitive within the markets. Three key features for maximum utilization of future information-based marketing are essential (Day & Wensley, 1988):

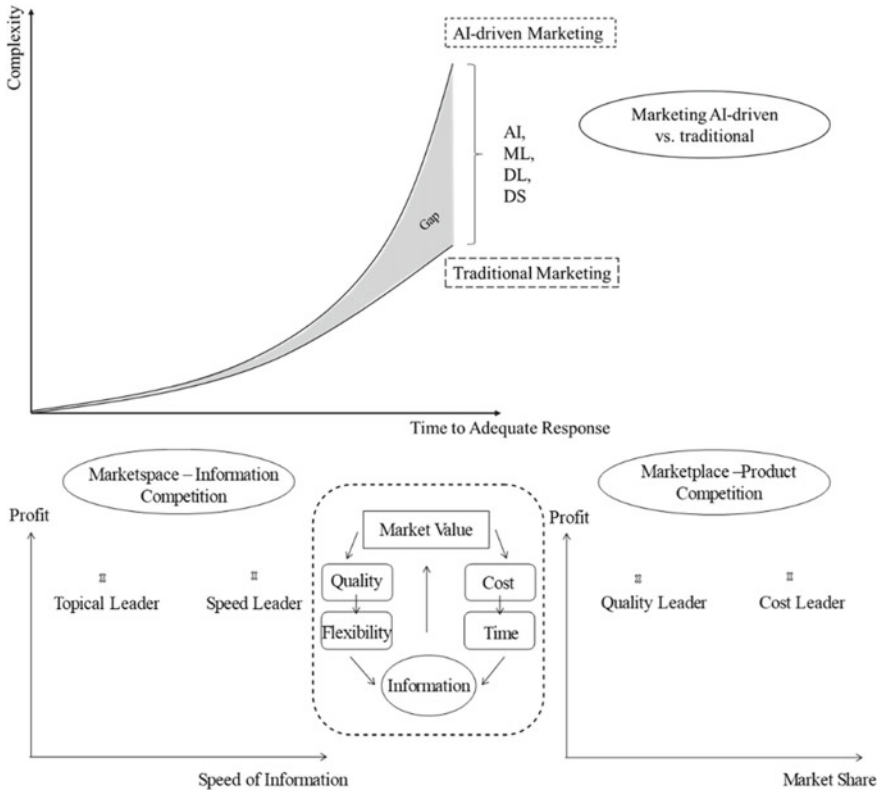

Fig. 7 Market success factors in cyberspace. *Source* Weiber and Kollmann (1998), extended by the authors

1. Digitalization—simplifying transmission of information through digitalization and expanding the target person scope and speed significantly.
2. Interactivity—producing a shift from one-dimensional to multi-dimensional media communication through the interactive transmission of information. Through interactivity, firms can engage in mass communication, interact with consumers and gain feedback through reciprocal communication.
3. Individualization—due to digitalization and interactivity in information processes in the marketspace, the way for individualization is paved and "quasi-personal" contact between market actors is enabled.

Excelling in these three features would undoubtedly help create a sustainable competitive advantage and to improve the bundle of outputs offered in cyber-physical space.

13 Machine Learning and Deep Learning (ML and DL)

Deep learning is a form of machine learning that enables computers to learn from historical data and understand the world solely in terms of a hierarchy of concepts (Goodfellow et al., 2016). Furthermore, the hierarchy of concepts determines the computer's knowledge by enabling it to learn from experience and build on simple complex concepts. One of the major activities in ML and DL is image recognition and tracking, where the challenging part is coping with image changes and distinguishing between the target and the surrounding environment, therefore training with translated and scaled sample patches are required (Goodfellow et al., 2014). Training deep neural networks is complex because the distribution of each layer's input changes during training as the parameters of the previous layers change (Ioffe & Szegedy, 2015). As a result, the process slows down the training by requiring lower learning rates and making it harder to train models with saturating nonlinearities. A common issue with neural networks is overfitting especially with deep neural nets with a large number of parameters. A simple way to prevent this problem is by implementing "*Dropout*", a strategy that reduces the number of parameters based on relevance (Srivastava et al., 2014). Nevertheless, batch normalization through an acceleration of deep network training by reducing internal covariate shifts eliminates the need for dropout and saves time (Ioffe & Szegedy, 2015). The advancement of neural information processing systems has turned out to be very beneficial in terms of increasing speed and accuracy. Estimating generative models through adversarial nets by training a generative model G that captures the data, and a discriminative model D that estimates the data simultaneously improves the quality of the information significantly due to the higher number of filters (Goodfellow et al., 2014). Scene recognition is another relevant feature within the recognition technology as it is one of the hallmark tasks of computer vision which enables the definition of context for object recognition (Zhou et al., 2014). This tremendous progress in recognition technology comes because of "*Convolutional Neural Networks*" (CNNs) and their

ability to accurately analyze and recognize people and objects from various perspectives (Karpathy et al., 2014). In addition, Microsoft "*Common Objects in Context*" (COCO) is a technique used for object recognition and is achieved through gathering images of objects in their natural context and positions, thus, familiarizing the tool with the art of context (Lin et al., 2014).

14 AI Conclusion

Despite its limitations, this chapter has given relevant insights to incorporating AI and establishing a bridge with marketing through conducting an in-depth literature review and acknowledging key contributions. The historical journey of AI is portrayed chronologically according to the "AI bible" from Russell and Norvig (2002) where the most important milestones are highlighted, and key contributors are acknowledged. Since the late 1970s, AI has been capable of improving human decision-making as well as the subsequent productivity in multiple business endeavours through business pattern recognition, gathering data and information, and analyzing them intelligently (Min, 2010). Furthermore, advances in big data, IoT, and social media are the major foundations upon which this bridge between AI and marketing must be established on solid grounds. These advancements in the field of AI will continue to accrue, and AI will continue to penetrate businesses and organizations at an unprecedented rate. Therefore, a bridge between AI and marketing should enable humans and machines to work in a complementary way at each other's strengths, hence, helping businesses and organizations progress to the complexity awaiting them in the future.

15 Strategic Recommendations and Conclusions—The Emergence of a Design Logic as a Theoretical Synthesis

The evidence-based search committed to analyze the essential publications within SDL and AI described a solid overview of how the movement evolved from its inception (Vargo & Lusch, 2004a) and also how the AI-driven advancements have paved the way for a unified and complementary framework upon which more fruitful theoretical and practical technologically laden grounds could be designed within marketing. We believe that the complementing SDL framework with a designerly way of enhancing the theoretical-practical accomplishment would deliver solid theoretical foundations. Hence, the notion of the evolving logic remains to the degree that a new paradigm shift in marketing due to the vital developments in high-tech and shifts within the fabrics of societies need to be incorporated in a way that it would align the fields of traditional marketing and AI-driven technological advancements. The cornerstone of design as a field of practice and as an essential pillar of human knowing was laid by Simon (1962), Cross (2001), Östman (2005), Archer (1979), Romme

Fig. 8 Design as the third area

(2003), who have also delivered some solid contributions towards understanding design as modes of human and organizational engagement with the complexities of the environment. Constructing on Archer, the authors treat design as a different culture from the sciences and the arts (see Fig. 8) in terms of "*designerly ways of knowing thinking and acting*", which has been distinguished in its own right (Cross, 1982; Simon, 1969). While Cross (2001) and Schön (1983) took things a step further in that they advocated for going the design path of inquiry as to the intellectual structure of a new field, Archer (1979) christened design as "*the third area*". Many scholars still advocate for a holistic and embracive approach between sciences and design as Owen (2007) states: "*… a combination of science thinking and design thinking is better than either alone as a source of advice.*" This view of science and design thinking is proposed as a possible path for marketing. Archer (1979), conceived "*design*" as a verb in the broader sense of professional apperception, by stating: "*… to design is … defined as to conceive the idea for and prepare a description of a proposed system, artefact, or aggregation of artefacts*" (Alexander, 1992). The holistic nature of design is reflected also within the original definition of Simon, where he constructs: "*Everyone designs who devises courses of action aimed at changing existing situations into preferred ones. The intellectual activity that produces material artifacts is no different fundamentally from one that prescribes remedies for a sick patient or the one to devises a new sales plan for a company or a social welfare policy a state*" (Simon, 1962). Thomas and Carroll (1979) state: "*Design is a type of problem solving in which the problem solver views the problem or acts as though there is some ill-definedness in the goals, initial conditions or allowable transformations"*. Schön (1938) substantiates this claim by stating: "*The designer shapes the situation, in accordance with his initial appreciation of it; the*

situation 'talks back', and he responds to the backtalk". Simon (1969) argued for establishing a design approach in economics and engineering and other disciplines including all the artefacts' and organizations' creating capacity (Bayazit, 2004), which has yielded some impressive results by borrowing from areas that range from architecture to NASA.

Figure 8 illustrates a model of design as the third way, whereupon a solid foundation for human understanding and education was laid. The model puts the notion of modelling at the core of design and as the interpretive logic of the field, while humanities are embraced via languages and mathematics within the dimensions of notation. Contemporary marketing theory needs to answer three essential questions for the field from an existential-phenomenological view of the organizations. What scholars and practitioners of marketing need to observe is that design asks questions in pursuit of "*a how can reality*", while sciences are based on the metaphysical apperceptive inquiry of "*a what is there reality*". Due to the nature of the questions asked the notion of "*truth-seeking*" also changes, hence truth in terms of design pursuits "*un-concealment*" of a co-evolutionary search space a creationary-inventive embodiment of "*possible worlds*" (Heidegger, 1954), while sciences pursuit a "*what is out there truth*". Taking the contemporary definition of marketing: "*Marketing is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large*" (AMA, 2017). Marketing is, thus, founded within the dimension of conducting three jobs (Christensen et al., 2016b) concurrently, while the notion of "*creating*" as the cornerstone of the activity is postulated with a holistic framework of value apperception for the firm, the customer and the society at large. Here not only creating the artefact upon which a service is rendered, is a foundational design activity but moreover the dimensions of communicating and delivery are regarded as essential areas of design as well, whereupon marketing can integrate more essential scientific pillars, of which the whole AI movement as the holistic embodiment of the digital turn within marketing can be based on fruitful possible grounds. This, of course, does not mean that marketing should ignore other scientific integrations for the field, but moreover, to pursue aligning the fields, the design Weltanschauung (DWA) as a possible logic of a theoretical synthesis is established (Fig. 9).

1. What are the firms' legitimacy and raison d'être → who are we, what is our purpose?
2. How can we manage the firms' exiting priorities within the time zone of "now"?
3. What needs to be done in the future? Here is a distinction between a linear and a future to which the philosopher Jacques Derrida referred to as l'avenir.

Constructing on Derrida, who stated: "*In general, I try to distinguish between what one calls the future and 'l'avenir.' The future is that which—tomorrow, later, next century—will be. There's a future that is predictable, programmed, scheduled, foreseeable. But there is a future, l'avenir (to come), which refers to someone who comes whose arrival is totally unexpected*" (Dick *et al.*, 2005) (Fig. 9).

For market(-ing) theorists of today, *Design Weltanschauung* (DWA) would deliver a boost in their capabilities and phenomenologically creative work of creating

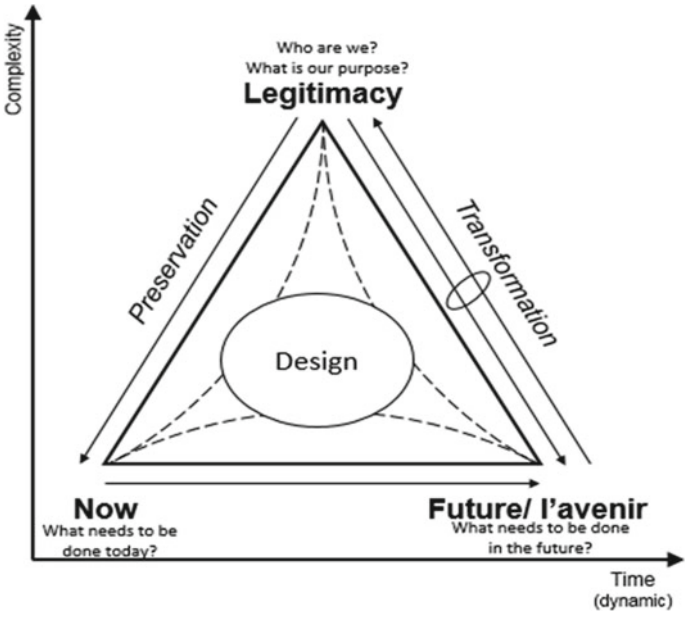

Fig. 9 Design Weltanschauung

promising possible worlds of value. Hence, by enhancing the boundaries of communication at a lower cost, and furthermore by designing solid GVC for resilience in delivery, the essence of a sustainable competitive advantage can be achieved. Here also lies the difference in terms of the firms' design of the essential digital-physical capabilities that distinguish an *Amazon from a Sears, or a Netflix from a Blockbuster* (Fig. 10).

Figure 9 above displays the foundations of a DWA, where firms can navigate the turbulent markets within the dimensions of (1) "*preserving*" the legitimacy of today, while (2) "*transforming*" the organizational raison d'être by the structural dynamics of the firms' ambidextrous embodiment, thus exploiting opportunities within the time dimension of today, while exploring the capabilities that are essential for the future (O'Reilly III & Tushman, 2008). Creation in design is based on the inventive capabilities of firms' "*creative destruction*" capacity towards excellence by a higher rate than what the market perceives as illusion for innovation. Schumpeter (1947) observes: "*… it refers to the incessant product and process innovation mechanism by which new production replaces the old*", *thus so too theories.*

Figure 9 illustrates, how designerly based marketing via the "*Design Weltanschauung*" (DWA) can be applied, thus as already established the cyber-physical markets are bending towards complexity within the pivot of a digital turn with an ever reducing dynamic of responsiveness in time to attenuating the rapidly changing

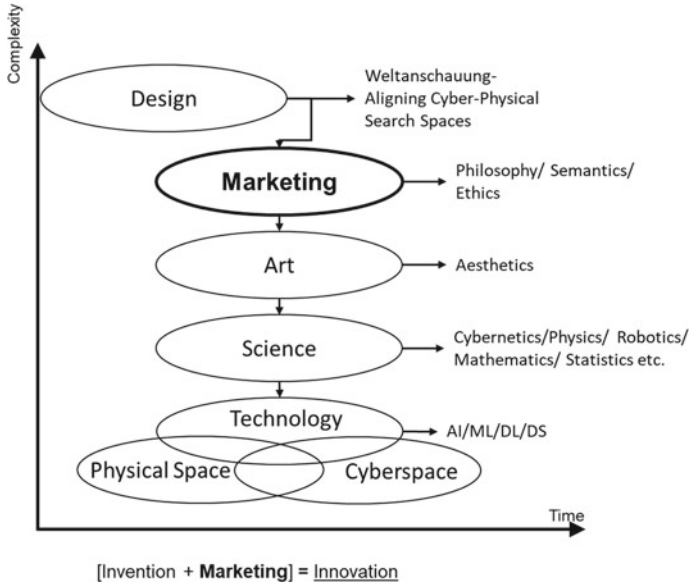

Fig. 10 Design Weltanschauung applied

market environments. Special attention is given to the already established philosophical and artistic foundation that defines marketing from a designerly way of inquiry.

16 Application of Theoretical Synthesis to the Problem

Marketing's raison d'être is shifting from the boundaries of a purely "*transactional mass- marketing*" market towards essential and vital societal implications. The dimension of thought in marketing needs to meet the evolution of the design-based-cyber-physical-service-economy. The sustainability mindset delivers many aspects that go beyond the rationale of economics Weltanschauung. Marketing has evolved towards becoming a field, which is high-tech driven. The evolution of AI rising global complexity has brought up a need for a marketer, who must holistically bridge many fields of science. Within the dimensions observed so far, we would like to propose a framework to enhance marketing theory by constructing a conceptual framework as described above by DWA, thus aligning these diverse challenges and proposing a holistic framework that delivers a solid model to cope with resulting disruptions. Lusch (2007) distinguished the evolution of marketing thought and practice as going through three stages over the past millennium: (1) "*to market*", meaning bringing the products to some sort of market; (2) "*market(ing) to*", meaning marketing the products and or services to some sort of segmented customer focus group; and

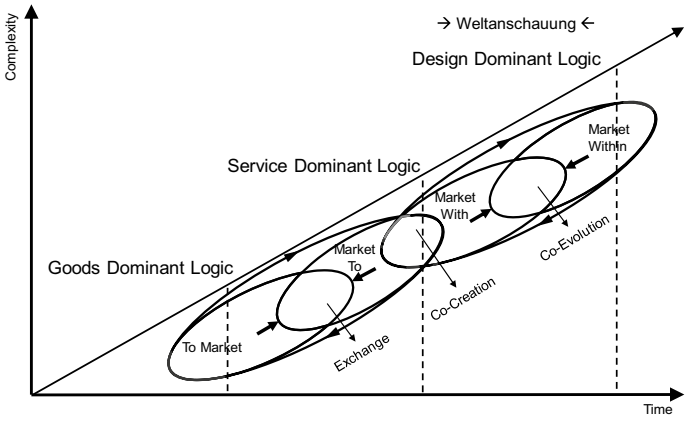

Fig. 11 The transition of marketing from goods- to service- to design-dominant logic

(3) "*market(ing) with*", in terms of co-creating value based on the resources and core competencies' integration of the perceived value. Hence, Lusch illustrated how marketing, in both theory and practice, is moving away from a "*market(ing)-to*" towards philosophy, and practice, thus, towards pragmatism, and a "*market(ing)-with*" philosophy and practice. The authors are proposing an additional *dimension of* "*market within*"—within the view that Lusch (2007) constructed, which is described in Fig. 11.

The notion of DDL goes beyond the limits of exchange and co-creation and paves the way for "*co-evolution*" as a foundation that transcends towards a designerly and self-organizing concept of the "*market-within*" dimension of a "*design search space*" of customers and firm relations. As DDL advances the notion of co-creation towards the dimension of co-evolution, wherein marketing spectrum is based on the self-organization of the actors, it brings forth additional windows of opportunities that may not be foreseen avant la lettre, which is coined as "*market within*" as the designed search space of evolving value perception. It perceives actors to align themselves within the spectrum of a "*co-evolving*" and *self-organizing*" foundation for a "*Unique Design Proposition*" (UDP). This co-evolving and self-organizing search space creates a unique design experience, which evolves towards the attraction of a loyal global consumer base beyond the pure product development focus group pursuits and linear consumer relationships. The DDL provides an alignment of all the essential dimensions that the firm would require to excel in coping with disruption, hence the forces that create disruption are aligned with the firms. Furthermore, the firm's core competencies are intertwined with the design-search spaces, which are powered by the interplay of technology, cyberspace, and physical experience spaces, and macro-level customer engagements. The DWA achieves normative robustness for the firm by constructing a model of convergence from reductionism towards holism. It develops marketing towards one of the major fields that affected the society

beyond the notion of pure economics, as the major car for converting inventions into innovations (Fig. 11).

Within the dimension of DWA-applied marketing evolves towards a holistic foundation, wherein many fields are put into a designerly context of observing the possible synergies of diverse fields of sciences as philosophy, semantics, ethics, aesthetics, cybernetics, physics, mathematics, statistics, robotics, and computer science, which are integrated to establish the firm's viability in a disrupting global and digital environment. Practitioners can decode the weak signals of the wider market and design favourable *direct-to-consumer strategies* (DTCS) by embracing disruption as a powerful motor to proactively design non-linear consumer-experience spaces. This notion would give the firm proactive flexibility to create a sustainable competitive advantage. To achieve a solid foundation for all the diverse fields, we suggest observing marketing from the lenses of design instead of a pure economics lens. While economics connects the actors in a transactional mode of interaction, design delivers a holistic foundation, wherein not only the diverse fields could be aligned, but moreover, a foundation for the development of marketing theory for the contemporary era of the digital turn could be paved. We see service as the essential output of the organizational system. Hence, SDL sees actors as resources-integrating entities and the notion of shifting the model of interaction from exchange to co-creation of value in a joint-value enhancing mode, in terms of service-for-service exchange, which was a necessary step in developing the theoretical foundation of marketing. However, combining SDL-orientation with DWA and DDL would explain the co-evolution of marketing beyond the notion of an output orientation, towards a synergy of many essential fields under the umbrella of marketing (Fig. 12).

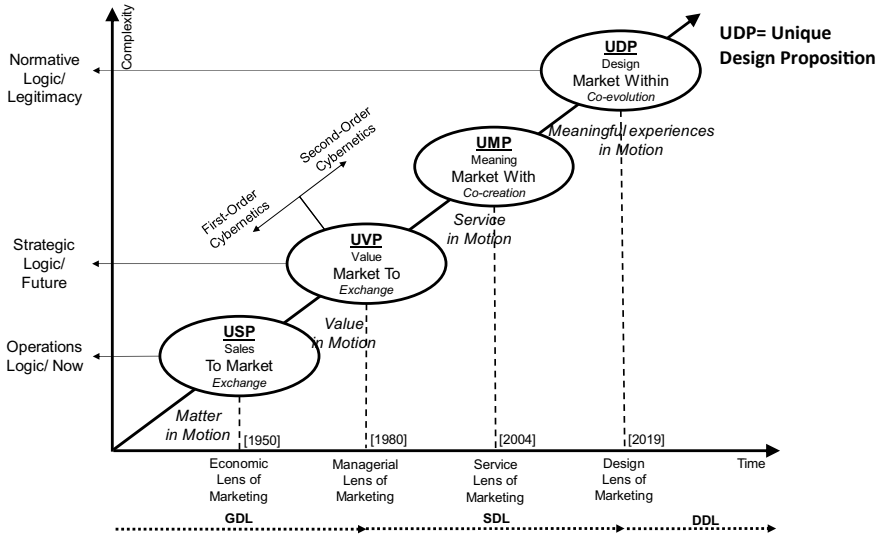

Fig 12 The transition of propositions from a marketing perspective—from USP to UDP

Traditional marketing started with the notion of matter in motion, thus bringing the produced goods "*to market*", within the "*transactionary interaction-space of exchange*", by making sales via a USP modus operandi, which was dominated by the economic logic of the firm. The next managerial logic of marketing set forth the foundation towards knowing the consumers' perception of value by reductionism of market segmentation. At this stage still dominated the foundation of marketing via the UVP. SDL has paved the way towards the meaning of "*what job needs to be done within the lives of consumers and firms?*" (Bower & Christensen, 1995), wherefore the actors (A2A or B2B, etc.) would hire us to do the job better than any other competing rival. Here, a major step was paved in understanding the "*joint co-creation-meaning space*" of a value-based reality of UMP that the firm perceives with the recourses integrating actors under the spectrum of service, thus, shifting the foundational premise of marketing from exchange towards "*co-creation*" in terms of "*market with*" the consumer. However, DDL perceives actors to align themselves within the spectrum of a "*co-evolving*" and self-organizing foundation of a unique design proposition (UDP), thus by transcending the *joint co-creation-meaning space* towards a new "*joint design search space*", wherein the marketing relation is extended towards the evolutionary phenomenon and wherein actors' are engaged in a co-designing platform of "*self-actualizing cyber-physical space realities*" of the "*market within*" the design-possibilities a firm provides. A good example here would be firms like Apple, Samsung, Google, etc., where what they are designing are unique design experiences, which evolve to a global consumer attraction force that lies beyond pure product development and linear consumer relationships. The DDL-applied framework has provided a possibility of alignment of all the essential dimensions as the DWA-applied model has displayed that the firm would require to excel within the turbulence of global disruptions and where the core competencies of the firms are aligned by the unique "*consumer design search spaces*" (CDSS), which are powered by the interplay of technology, the cyberspace and the physical experiences space that serves as the UDP that firms provide. To observe the raison d'être of marketing coping with the disruption of today, we introduce the DWA as a new lens. For marketing to achieve normative robustness, we construct a model of convergence from reductionism towards holism.

DWA evolves marketing towards one of the major fields of business studies that have affected the society beyond the notion of pure markets, as the major car for converting inventions to innovations. Within the dimension of DWA, marketing evolves towards a holistic foundation, wherein many fields, which typically were not aligned are put into a designerly context of observing the synergies of diverse fields of sciences as philosophy, semantics, ethics, aesthetics, cybernetics, physics, mathematics, statistics, robotics, and computer science, which are aligned to establish the firms' viability in a disrupting global and digital environment.

17 Implications and Conclusions

To observe the raison d'être of marketing coping with the disruption of today, we have introduced a meta-model of the DWA as a new lens for the possible developments of marketing theory. Thus, to achieve normative robustness, we construct a model of convergence from reductionism towards holism. The DWA-applied model evolves marketing towards one of the major fields of integrating diverse essential perspectives, as the major car for converting inventions to innovations. The dimension of the UDP of the market (ing) with the dimension of possibilities that the firm can go beyond the traditional path e.g. Netflix by changing the movie experiences. Hence, for new movies, the first release was to theatres, then within a period of approximately 3 months they would be released to DVD (sales and rentals), furthermore, another release was conducted to video on demand (VoD) and pay-per-view services for approximately another 6 months. Additional releases to networks would take another 6 months. Finally, for approximately 7 years the movies were broadcast for a larger audience on TV. *Netflix* has changed the traditional model of product lifecycle of movies globally, thus not only has it innovated the way consumers watch movies but moreover that we are experiencing a shift in the whole digital entertainment consumption from TV to movies, documentaries, TV shows, and comedy. This shift also embodies a change from the linear and passive model of entertainment consumption towards an interactive model of viewer-participating and co-evolving mode. *Netflix's* move towards vertical integration to become a top content producer itself has delivered much success and a vital competitive advantage for the firm. Furthermore, *Netflix's* vital move to save the iconic "Paris" theatre in New York is a vital display of how streaming services are changing the film industry and the whole entertainment-experience-economy by covering both the cyber and the physical environments. This also gives *Netflix* the leverage to move beyond laptops, smart TVs, and post-PC devices towards becoming an experience innovator. Furthermore, the direct-to-consumer relationship strategies are the next frontiers of sustainable competitive advantage that changes the business models of some of the iconic brands in the world. Disney's latest movie from a producer to a distributor is a designerly based strategy that will take many distributors even successful partners out of the GVC. With the power of the cyber-physical models, many promising co-evolving experiences are in the making, thus bringing marketing and design into concert will bear many fruitful strategies for the human side of un-concealing technology in the cyber-physical realities of the digital age.

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Digital Literacy of Digital Natives

Dalia Suša Vugec and Ana-Marija Stjepić

Abstract Digital transformation is quickly progressing in all spheres of human life and new generations have to adjust to changes that the digital age caused in the economy and society. Consequently, digital literacy is becoming one of the crucial skills of today's students. Therefore, the education system needs to understand the growing significance of adjusting and modifying its educational methods to support the needs and specific characteristics of generations living in the digital era. Students born and raised in the strongly developed digital environment are presented as digital natives. This chapter provides a theoretical overview of the context of digital natives as well as the methodology and results of an empirical research conducted among two generations of digital natives, one in 2015 and one in 2020. The main aim of the named research is to assess the attitudes of students towards learning information technology, frequency of their usage of modern tolls such as Google tools, e-mail, and Microsoft Office tools as well as the levels of their digital literacy.

Keywords Digital literacy · Digital natives · Learning IT · Students

1 Digital Age

The dramatically rapid development of technology has led to great changes in the world. From the appearance of the abacus, through the first mechanical computer to the emergence of social networks such as Facebook, Instagram, etc., and then the increasingly popular Internet of Things, the world has adapted and developed in accordance with the development of technological innovations.

The world as we know it today has shaped itself in line with the industrial revolutions that have taken place over time (Fig. 1). Thus, in the first industrial revolution (Industry 1.0), that took place in the eighteenth century, the emergence of the steam engine that allowed the introduction of mechanically assisted production happened (Croatian Chamber of Commerce, 2021). Two centuries later, during the twentieth

D. Suša Vugec (✉) · A.-M. Stjepić
Faculty of Economics & Business, University of Zagreb, Zagreb, Croatia
e-mail: dsusa@efzg.hr

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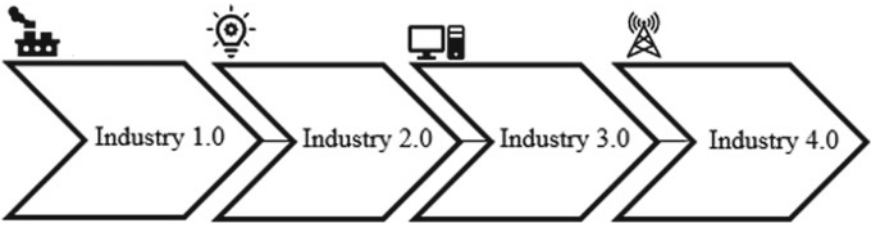

Fig. 1 Industrial revolutions through the time (*Source* Authors' work, 2021)

century, an era of the second industrial revolution (Industry 2.0) began. In this industrial revolution, mass production occurs as a consequence of the application of electrical energy (Croatian Chamber of Commerce, 2021). Information technology (IT), along with computer technology, has been emerging in the next industrial revolution (Croatian Chamber of Commerce, 2021). The third industrial revolution (Industry 3.0) was characterized by the application of various information and computer technologies that contributed to the development of automation in production processes (Croatian Chamber of Commerce, 2021). Today's era, the era of development and application of digital technologies, and the consequent digital transformation of the business of all kinds (e.g., medicine, tourism, manufacturing, etc.) are also called the fourth industrial revolution (Industry 4.0). The fourth industrial revolution began in the twenty-first century and is actually based on the digitization and application of the Internet of Things (IoT) concept that enables the networked operation of production facilities (Croatian Chamber of Commerce, 2021). The fourth industrial revolution, also called the "digital transformation," arose from the Internet and the increased networking of people and machines into one global business network. In the industry of the fourth revolution, with the help of so-called smart technologies, smart products are created and implemented through smart processes. With the help of the cooperation of digital and physical processes in the organization, organizational and geographical boundaries become insignificant (Schmidt et al., 2015), and business activities are now mostly carried out globally.

In today's digital age, it is almost impossible to imagine an organization without computers in its business, internal and external business networking, access to social networks for advertising, storage, processing, and analysis of business data supported by IT, etc. Due to the rapid development of diverse technological advances through time that generates more and more data, today's business organizations depend on quality analysis and interpretation of data that have become crucial elements of business success and competitive advantage maintenance in the market. Organizations that want to be competitive and sustainable in an increasingly demanding and turbulent market must keep pace with the changes posed by IT (Aleksić, 2009; Belak & Ušljebrka, 2014). According to the European Commission (2020), large, and small and medium-sized enterprises within the countries of the European Union at most adopt technologies as Electronic Information Sharing systems (ERP systems), Customer relationship systems (CRM systems), and social media (Fig. 2).

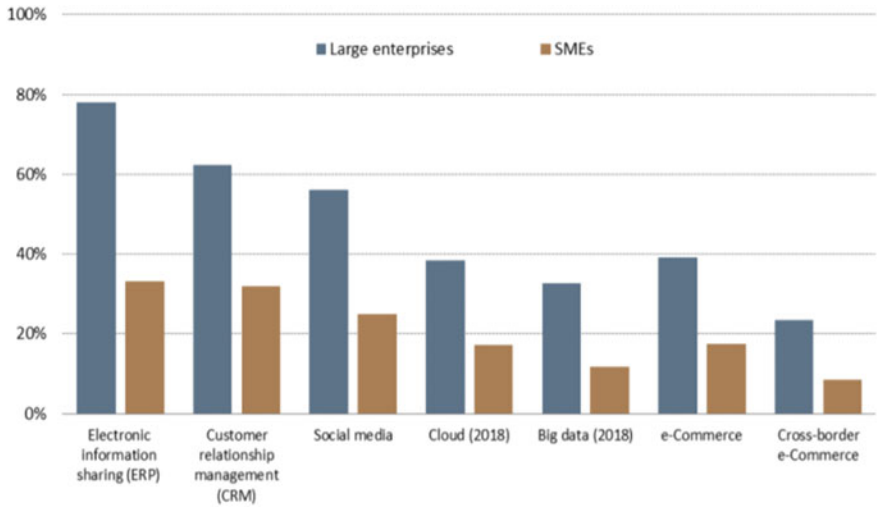

Fig. 2 Technology adoption within large and small and medium-sized enterprises within the countries of the European Union (*Source* European Commission, 2020)

Digital technologies development and consequent changes that are imposed on organizations by their wide implementation worldwide, bring various benefits for organizations but also challenges and risks that organizations must promptly respond to successfully overcome them. According to Ali et al. (2018), technological development and the digital age have radically changed the ways organizations conduct their business. Such changes, driven by digital transformation, are equally taking place in organizations across developed and underdeveloped countries in different fields of activity (Maiti & Kayal, 2017).

Additionally, concepts like digital transformation, digitization, and digitization can be often found in the literature. These terms differ in their meanings, so it is advisable to define them correctly and use them correctly. The term digitization denotes the process of changing and improving business models, business values, etc., using digital technologies, while the term digitization denotes the transition from analog to the digital state of affairs (Gartner, 2018). Viewed from the broadest point of view, the notion of digital transformation can represent any changes in human life, which are encouraged by the introduction and application of some, for him, new innovative technologies (Cocca et al., 2018; Stolterman & Fors, 2004). It is important to note that digital transformation can occur not only at the level of the individual but also at the level of the organization or the entire industry in which the organization operates (Lankshear & Knobel, 2008).

According to the results of the Digital Economy and Society Index (DESI), measured by the European Commission (2020), that observe connectivity, human capital, use of the internet, integration of digital technologies and digital public services, Finland, Sweden, Denmark, and the Netherlands are the leaders in the

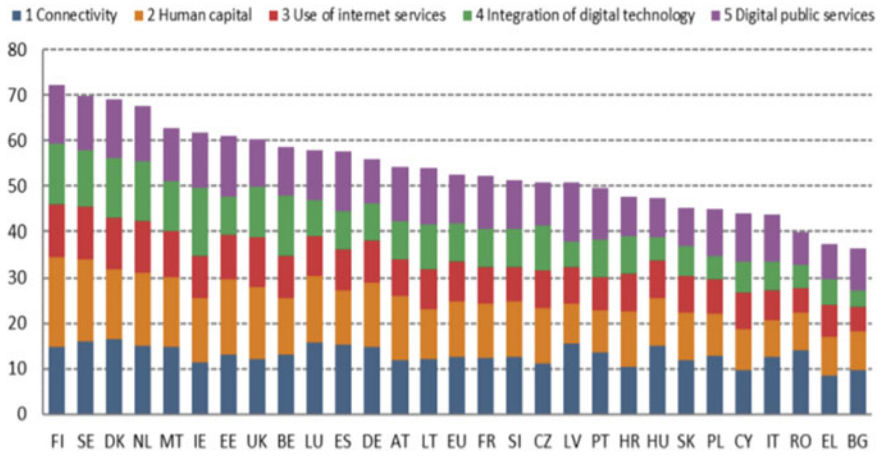

Fig. 3 Digital and society index 2020 within the member countries of the European Union (*Source* European Commission, 2020)

digital age (Fig. 3). On the other hand, countries like Bulgaria, Greece, Romania, and Italy did not show significant effort in "becoming digital" (Fig. 3).

2 Digital Skills Versus Digital Literacy

The development of technology and the application of digitalization in all spheres of human life have imposed the need for skills and knowledge that users should possess in the digital age. Already back in 2014, the authors, Brynjolfsson and McAfee (2014), emphasized that new technological achievements in the future will impose new knowledge and skills that will be required of workers.

At the outset, it is very important to distinguish between the concepts of digital literacy and digital skills. According to authors Richardson and Bissell (2019), digital skills involve the application of IT skills to solve a particular problem. On the other hand, digital literacy defines the ability to find and use the information received from a variety of digital sources (Bawden, 2008).

For many economies around the world, the key to successful digital transformation lies precisely in the digital skills of its citizens (Maji & Laha, 2021). Thereby, digital skills can be observed as a backbone of todays' digital economies (European Commission, 2020). According the Saputra et al. (2020), digital skill encompasses general and specific skills related to information and communication technology (ICT) usage. Today, digital skills have become commonplace and something that falls under the normal skills of every human being, such as reading (Maji & Laha, 2021). Digital skills are considered imperative for the normal functioning of everything around us in today's modern world (Maji & Laha, 2021). Even those people

who used to have a kind of resistance to the emergence of new technologies, today use certain digital technologies that enable them to function normally in life. Those technologies were a "must-have," especially during the COVID-19 pandemic (Maji & Laha, 2021). According to the European Commission (2020), there was an increase in the number of Internet users during the COVID-19 pandemic, however at the same time, that was not an indicator for the risen number of people possessing a higher level of digital skills. Therefore, it is important to perceive how the higher percentage of new digital technologies utilization is not directly correlated with digitally skilled users growth (European Commission, 2020).

Figure 4 present the digital skills level of European Union Member States citizens from 2015 till 2019. According to the European Commission (2020), European Union Member States as the Netherlands and Finland have the highest number of people with sufficient levels of digital skills, while Bulgaria and Romania still got enough space to increase an adequate level of digital skills of their citizens.

On the other hand, digital literacy should be viewed as a specific ability of users to cope with digital technologies as opposed to generally defined digital skills. It is important to have sufficient digital skills in handling digital technologies such as keyboard, mouse, printer, smartphones, etc., but the question is whether users know how to use them properly and for the right purposes. An even more important question in the context of digital literacy is whether users know how to handle the information provided by modern digital technologies (Martin, 2008). Digital literacy is actually the ability of users to successfully find the information they need with the help of digital technologies, distinguish relevant from irrelevant information, use it ethically while protecting their own and others' privacy and security in the digital environment (Buckingham, 2006). According to Tohara et al. (2021) self-reliant learners, living in the era of digital transformation, and rapid development of digital technologies, can only be established by having a sufficient level of digital literacy. Therefore, digital

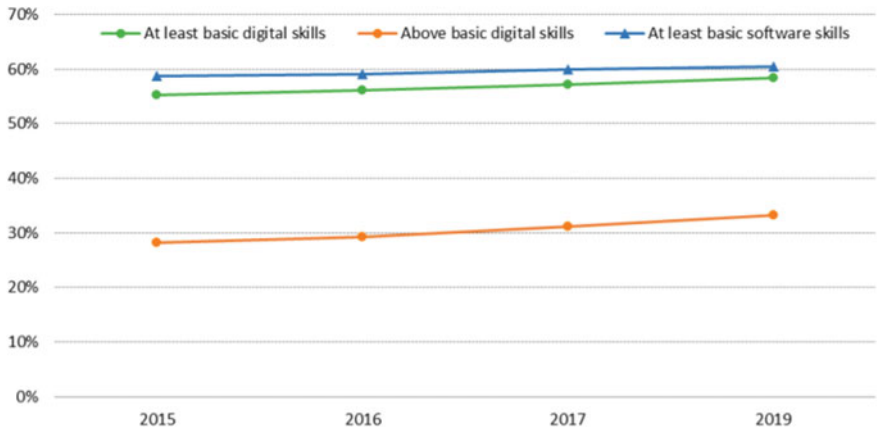

Fig. 4 Digital skills from 2015 to 2019 (*Source* Eurostat, community survey on ICT usage in households and by individuals in European Commission, 2020)

literacy can be observed as the ability of users to independently and critically analyze information and transform them into needed knowledge and wisdom (Buckingham, 2006). Furthermore, digital literacy can encompass comprehending the importance of digital technology progress and the ability to assess its positive and negative effects on the economy and society worldwide (Buckingham, 2006).

The term digital literacy is used inconsistently in the literature, according to Eshet-Alkalai (2004), because it is defined differently by different authors. Some authors define it as cognitive and socio-emotional aspects of working in a computing world, while others define it as technological aspects of living in a digital environment. Several academics have described various sorts of IT literacy types in this context (e.g., Buckingham, 2006; Martin, 2006; Koltay, 2011; Ng, 2012). For example, one should be aware of the distinction between computer literacy, which refers to a small collection of skills that enable a person to work successfully with software applications or perform simple information retrieval tasks (Buckingham, 2006), and information literacy, which refers to the ability to think critically and to browse, find, and evaluate Web-based knowledge efficiently (Ng, 2012). In addition, Koltay (2011) defines information literacy as the one which enables people to recognize when certain information is needed. Digital literacy, on the other hand, covers a variety of abilities connected to the capacity to utilize basic IT such as spreadsheets and word processors, as well as to use search engines and databases in a more complex fashion, all while keeping online safety in mind (Buckingham, 2006).

While Martin (2006, p. 155) defines digital literacy as "the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process," Ng (2012, p. 1066) defines it shortly as "the multiplicity of literacies associated with the use of digital technologies." Following that definition, it is explained that digital literacy comprises, besides, information literacy, many other types of literacies as well, for example, being (Eshet-Alkalai, 2004; Eshet-Alkalai & Chajut, 2009; Ng, 2012; Jůvová, 2017; Rea-Guaman et al., 2017):

- critical literacy – referring to the capacity to study textual, visual, spoken, multimedia, and performance materials in order to examine and challenge underlying attitudes, values, and beliefs;
- reproduction literacy – referring to the capacity to generate real, meaningful written and visual works using the reproduction and manipulation of previous digital text, images, and audio elements;
- branching literacy – referring to the capacity to generate knowledge through nonlinear navigation through domains of knowledge, such as the Internet and other hypermedia environments;
- operational literacy – referring to the capacity of an individual to be flexible, proactive, and sensitive to a variety of life situations;

- photo-visual literacy – referring to the capacity to communicate successfully in graphical contexts, such as user interfaces, that are based on digital technologies such as graphics;
- online etiquette literacy – referring to the capacity to understand and apply the good manners and other parts of etiquette in the online world;
- cyber safety literacy – referring to the capacity to protect the information assets, involving the elimination of risks that jeopardize the data processed, stored, and conveyed by linked information systems;
- social networking functional literacy – referring to the capacity to collaboratively and communicatively function through social networking platforms, and
- social-emotional literacy – referring to the capacity for successful communication using online communication platforms such as discussion groups and chatrooms.

2.1 Digital Literacy Framework

Having in mind the previously named types of literacies that comprise digital literacy, Ng (2012) proposes a framework for digital literacy, consisting of the following three dimensions:

- technical dimension,
- cognitive dimension, and
- social-emotional dimension.

As described by Ng (2012), technical dimension essentially refers to possessing the technical and operational abilities necessary to use IT for educational purposes and daily activities, which includes the ability to connect and utilize input and peripheral devices such as earphones/headsets, external speakers, and smartboards but also presupposes knowledge of working components, the capacity to safeguard data, and the ability to troubleshoot using manuals, help tools, and other web-based resources, such as YouTube. In that sense, technical dimension comprises operational literacy, critical literacy, reproduction literacy, branching literacy, and social networking functional literacy (Ng, 2012).

Cognitive dimension of digital literacy comprises information literacy, critical literacy, multiliteracies including photo-visual, audio, spatial, linguistics and gestural ones, reproduction literacy, branching literacy, online etiquette literacy, and cyber safety literacy (Ng, 2012). This dimension is connected with the capacity to think critically throughout the cycle of searching, evaluating, and creating digital information, and it not only entails the ability to analyze and select relevant software packages for use in learning or performing a certain activity but also necessitates an understanding of the ethical, moral, and legal implications of online commerce and content replication that make use of digitally based resources (e.g., plagiarism and copyrights) (Ng, 2012).

Social-emotional dimension, as described by Ng (2012), entail the ability to use the Internet responsibly for communication, socializing, and learning by adhering to

'netiquette' by following similar rules to those used in face-to-face communication, such as respect and the use of appropriate language and words to avoid misinterpretation and misunderstanding, ensuring individual safety and privacy by keeping personal information as private as possible and releasing no more than is required; and recognizing when one is endangered and understanding how to respond, for example, whether to ignore, report, or respond to the threat. This dimension, therefore, comprises social-emotional literacy, critical literacy, online etiquette literacy, and cyber safety literacy as well as the social networking functional literacy (Ng, 2012).

The described model of digital literacy implies that digital literacy is in the intersection of previously named three dimensions (Ng, 2012). The digital literacy framework used for the empirical research in this chapter is the one proposed by Ng (2012), and presented as previously described by the Fig. 5.

Taking into consideration all of the above, it is especially crucial for the educational system worldwide to strategically adapt its teaching and learning methods for new generations that will be the future workforce in the digital-shaped world. Consequently, the next chapter will provide a description of generations over time. After that, in further elaboration, the subchapters will give the general characteristics of the generations that make up the representatives of the digital era.

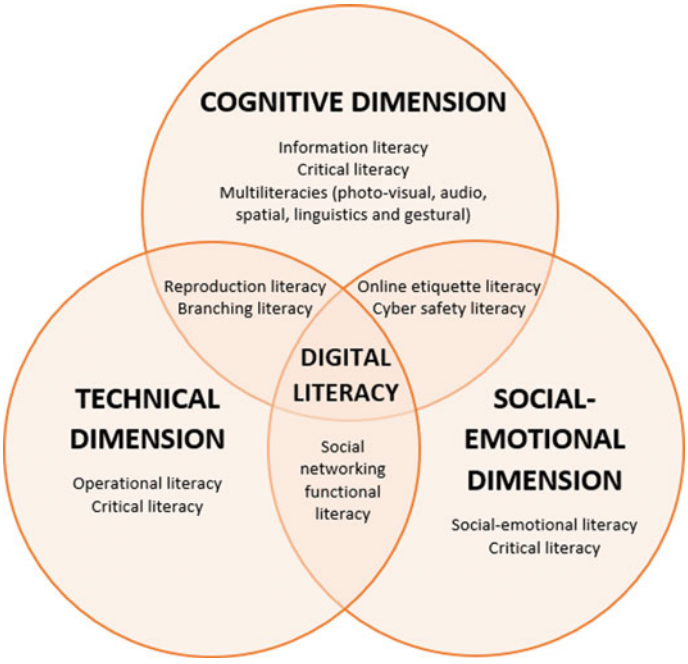

Fig. 5 Digital literacy framework (Authors' work, 2021 based on Ng, 2012)

3 Generations

Author Karl Mannheim was the first one who introduced generational cohorts at 1952 (Mannheim, 1952). During the time, this established theory about generational cohorts was further improved by many other authors in their scientific and practical works. For example, authors Strauss and Howe (1992) described differences among generations that appeared during the time in their book "*Generations: The History of America's Future*." Generational cohorts can be defined as a group of people, born and raised in the same period of time in which they experienced similar or same events, creating their common values and thoughts about life at that moment which consequently shaped their characteristics in each point of time (Koksal, 2019). According to numerous authors, e.g., Berkup (2014), Dimock (2019), etc., generations through time can be classified into five different generational cohorts: Silent, Boomers, Generation X, Millennials, and Generation Z. Such classification of the named five generations is presented by the Table 1.

On the other hand, there are many authors that recognize and distinguish yet another generation, the newest one, being Generation Alpha (e.g., Tootell et al., 2014; Carter, 2016; Cirilli et al., 2019, etc.). According to Cirilli et al. (2019), Generation Alpha comprises children born after 2010, while Carter (2016) estimates that the Generation Alpha is going to end with those born until the year 2025.

However, as it is clear from the literature and previously stated classifications, there is no unified definition of generational cohorts classification since many authors defined different time periods and names for each generational cohort (Dreyer, 2020). In that sense, and for the purpose of this chapter, Fig. 6 presents all six classes of generations that emerged through the time, according to Carter (2016) and Cirilli et al. (2019).

3.1 Silent Generation

The first generation called Silent represents people born and raised between 1925 and 1945, according to Cirilli et al. (2019). In the literature, this generation is also called "Builders" (Berkup, 2014) or "Lost Generation" (Enam, 2018; Dreyer, 2020), while

Table 1 Classification of five generations (*Source* Authors' work, 2021 according to Dimock, 2019)

Time period	Name of the generation	Current age in 2021
Born 1928–1945	Silent	76–93
Born 1946–1964	Boomers	57–77
Born 1965–1980	Generation X	41–56
Born 1981–1996	Millennials	25–40
Born 1997–2012	Generation Z	9–24

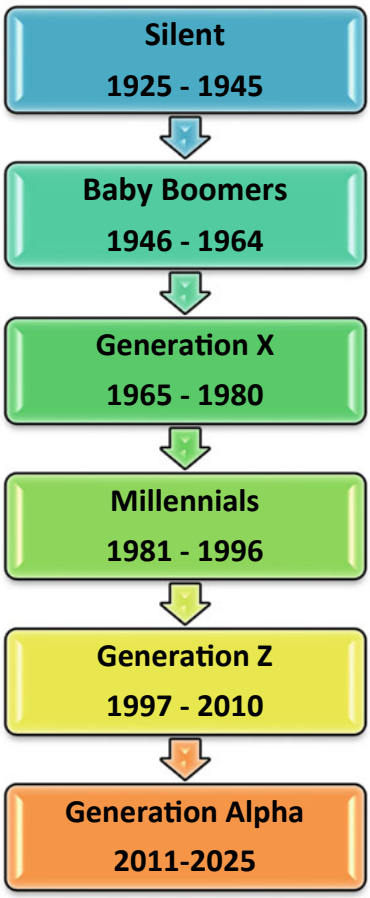

Fig. 6 Six generations through the time (Authors' work, 2021 based on Carter, 2016 and Cirilli et al., 2019)

Cirilli et al. (2019) also call them "Traditionals." They are the people who were born during the Great Depression and the World War II (Cirilli et al., 2019). Representatives of Silent generations are people characterized as disciplined, ethically oriented in work, grateful, and which strongly holding to their values (Dreyer, 2020). They want to fell needed and they strive for financial security, while also being patriotic, conservative, simple, and patient with high inter/intrapersonal skills (Cirilli et al., 2019). They also value traditional families, are very loyal to their employers while expecting the same amount of loyalty from them back, and also have understanding of the nobility of sacrifice for the purpose of common good (Cirilli et al., 2019).

3.2 Baby Boomers

Next were the Baby Boomers or just Boomers, generation of people named by the baby boom event caused by early marriages and high birth rate of Silent Generation members (Carlson, 2008). This generation is characterized by people born between 1946 and 1964, according to Cirilli et al. (2019). Cruz and Díaz (2016) describe them as people born in the post-World War II world, which was financially stable and increasingly optimistic, which made them witness several important changes in society, such as Women's Movement, Civil Rights Movement, and similar. Members of the Boomers generation can be described as creative, ready to take a risk at work, competitive, goal-oriented etc. (Dreyer, 2020). Cruz and Díaz (2016) also characterize them as idealistic, while Cirilli et al. (2019) add assertiveness, casualness, ambition, promotion of social causes, and optimism but without trust to the government to their characteristics list. They also have respect towards religion and family, and strong orientation towards work and career, as well as towards political and civil commitment (Cirilli et al., 2019). This transformation from individual and independent workaholic from Silent generation into people with characteristics which are focused on teamwork and collaboration happened because there were many members of Boomers and they needed to learn how to cooperate and work together (Zemke, 2003).

3.3 Generation X

Generation X is the next generation that presents people born and raised between 1965 and 1980. In the literature, this generation is also called "Gen X" (Stewart, 2017; Dreyer, 2020), "Latchkey Kids" (Cruz & Díaz, 2016), "Busters" (Cirilli et al., 2019), and "Generation Golf" (Enam, 2018; Dreyer, 2020). They were born during the period in history that is represented by the Watergate affair, Nixon's resignation, fall of the Berlin wall, emergence of computers and services such as MTV, etc. (Cirilli et al., 2019). Such events led to strong trends of divorces and economic uncertainty, but at the same time, the emergence of disco and hip-hop culture, video games, and cable TV (Cruz & Díaz, 2016). The representatives of Generation X are considered as depressed, focused, and mainly oriented towards balancing their personal and work time (Dreyer, 2020). They are described by Cirilli et al. (2019) as self-sufficient, ambitious, open to dialogue, multi-tasking and organized, tolerant towards differences, flexible, realistic, and rejecting the rules, while pursuing their personal development. Also, they seek stability and distrust in institutions since they believe in people and not in family, but, at the same time, they have a spirit of adaptation and responsibility (Cirilli et al., 2019). Cruz and Díaz (2016) also point out that they are skeptical of authorities and known for being individuals. Generation X members prefer informal and friendly workplaces where they can always learn and have the freedom and flexibility, as well as possibility to communicate regardless of

the title or the position (Cirilli et al., 2019). Since the first personal computer, also known as PCs, appeared during the 1970s, members of this generation were the first ones who witnessed the IT emergence and growth and who utilized IT in operating their work (Berkup, 2014).

3.4 Millennials

The next generation is called Millennials. This generation also has several names like Generation Y (Stewart, 2017; Dreyer, 2020), Gen Y (Dimock, 2019; Dreyer, 2020), Digital Generation (Tapscott, 1998), Net Generation (Tapscott, 2009), NetGen (Oblinger & Oblinger, 2015), etc. Members of Millennials are born and raised in the time period from 1981 till 1996, in the era of technological development such as instant communication via e-mails and text messaging (SMS), but also terrorism and swine flu (Cruz & Díaz, 2016; Cirilli et al., 2019). The Millennials can be observed as flexible workers and also the ones who take care of establishing the balance within the personal and business time in life. Since this generation is characterized by the further progress of IT as well as the appearance of the Internet (Postolov et al., 2017), members of the Millennials Generation show a higher level of curiosity, social awareness, and orientation to globalization (Dreyer, 2020). Cirilli et al. (2019) point out this generation to be the one that leaves their parent's home late in life, but are concentrated on the present, being hyper-connected, receptive, multitasking and having deep knowledge of technology. Similar, Cruz and Díaz (2016) point out that Millennials are very brand loyal and tech-comfortable. In addition, they accept diversity and tend to achieve goals in a short time and with people helping them, however, they have short attention and immediate gratification, while being entrepreneurial, ambitious, optimistic, impatient, informal, and individualistic. As employees, they tend to make a difference and want to be remembered for it, which is, for them, more important at their workplaces than their salary (Cirilli et al., 2019). They are curious and open to new things and perceive their jobs as opportunities to learn, and, in addition, as emphasized in (Cirilli et al., 2019, p. 5138), they "work to live, rather than live to work."

3.5 Generation Z

The following generation is the Generation Z that encompasses people born and raised in the time period between 1997 and 2010, characterized by the even greater emergence of terrorism, the Great recession, emergence of the World Wide Web and technologies such as iPods and social networks such as Facebook (Cirilli et al., 2019). Members of this Generation Z are also called GenZ (Bejtkovsky, 2016; Dreyer, 2020), Gen Tech (Postolov et al., 2017; Singh & Dagmei, 2016), PostMillennials (Enam, 2018; Dreyer, 2020; Oblinger & Oblinger, 2015; Bullen et al., 2011), Gen Wii

(Postolov et al., 2017; Singh & Dagmei, 2016), Children of Internet (Berkup, 2014; Levickaite, 2010) and also Digital Natives (Berkup, 2014; Levickaite, 2010; Persada et al., 2019), etc. Members of Generation Z are characterized as people familiar with digital technologies, as they were born in the digital environment (Dreyer, 2020). Cruz and Díaz (2016) emphasize that they witnessed widespread use of electronic gadgets and digital technologies such as Internet and social networking sites and media. Therefore, usage of media, various digital technologies, social networks for them is not something strange and undiscovered (Postolov et al., 2017; Dreyer, 2020). They are also more family-oriented than generations before (Dreyer, 2020). Cruz and Díaz (2016) point out that Generation Z members are tech-savvy, flexible, smart, and tolerant for diverse cultures and globally connected in the virtual world. Generation Z members are independent, very self-critical, highly connected to communicate, make innovative choices, are used to receive immediate information, suffer form the fear of being excluded and have little concern for privacy, except when it comes to the money (Cirilli et al., 2019). Furthermore, in their personal or business progression, they are looking for safety and estimation of values (Dreyer, 2020). At their workplaces, Generation Z members are used to education and trainings through the usage of social media who love to turn their passions into work, but are not team workers (Cirilli et al., 2019).

3.6 Generation Alpha

Generation Alpha is called the "Google kids" by Cruz and Díaz (2016), and includes people born after 2010 and, most likely, until 2025 (Carter, 2016). They are born into a world that is newly emerging from widespread economic slowdown, and are expected to be even more tech-savvy than the Generation Z, well educated and more materialistically oriented in comparison to previous generations (Cruz & Díaz, 2016). According to Carter (2016), Generation Alpha members favor visual and voice-controlled communication over typing and texting, are more open to augmented reality and thrive to be social media influencers. Cirilli et al. (2019) point out that Generation Alpha members are the most experienced in technology and that they know perfectly how to use technology practically since the day they are born. However, one of the characteristics of this generation is possible dependence on the screen, moreover since their screen time and time spent on devices is greater that their social time (Cirilli et al., 2019). They are used to having virtual friendships and socialize through virtual worlds and virtual realities, which can make them, despite the hyper-connection, fell lonely (Cirilli et al., 2019).

4 New Kids on the Block: Digital Natives

As mentioned earlier, generational differences stem mostly from the political, social, and cultural events that marked their period of time in which they were born and raised. The period of time in which adult members of Generation Z and Generation Millennials have been marked by the extremely strong and rapid development of information and communication technologies, Internet technologies, and digital technologies. This environment of rapid advances in technology has shaped members of Generation Z and Generation Millennials in terms of their adaptations to new ways and approaches to learning and the establishment and maintenance of social relationships (Bullen et al., 2011). These two generations fell under the same name "Digital natives."

The concept of "digital natives" was firstly introduced by the author Prenksy (2001a, b). Prensky (2001a, b) encompassed both generations, Millennials and Generation Z, under the same generation of people who were so-called "tech-savvy" (Judd, 2018). Prensky (2001a, b) also make a clear difference between digital natives and "digital immigrants." According to Nikou et al. (2019) members of digital immigrants are people born before 1980s and those people will, in a contrast to digital natives, always rather choose reading from a paper than reading from the display of the computer, mobile phone or tablet (Prensky, 2001a, b). Because of these differences in digital technology usage, the sufficient competencies of digital immigrants in teaching digital natives are often discussed. In scientific and practical circles, the digital skills that members of digital natives possess that digital immigrants have yet to acquire is also often debated theme (Nikou et al., 2019). According to Evans and Robertson (2020), digital immigrants can often be highly skilled in using digital technologies since they have a strong and long focus as well as developed ability to learn new skills by actively utilizing the information they get in the learning process.

Digital natives are described as learners in the continuously and aggressively progressive digital environment (Prensky, 2001a, b; Smith et al., 2020). According to Sarkar et al. (2017) digital natives comprises young members (learners) from Generation Z and Millennials that developed specific characteristics and personalities by playing various online games, watching videos on the Internet, using different mobile applications, etc. Moreover, the authors Nikou et al. (2019) describe how members of digital natives use the Internet, various online media, mobile phones, instant messaging for conversations, and other digital services on a daily basis since all of these technologies are already integrated into their everyday lives. Those newly developed characteristics of digital native members also shaped their needs and demands in the learning process by strongly changing and modifying current established learning methods (Sarkar et al., 2017). Digital natives are considered to be the crucial trigger for the educational system changes and further reform in the digital way (Evans & Robertson, 2020; Prensky, 2001a).

According to Sarkar et al. (2017) there are several common characteristics of members of digital natives that contribute to the new ways of shaping teaching

Fig. 7 Characteristics of Digital natives in learning process (*Source* Authors work, 2021 based on Sarkar et al., 2017)

and learning methods in schools and universities. Those characteristics are categorized into seven categories, as shown in Fig. 7. The following categories of learning characteristics of digital natives are:

1. Environment that comprises digital technologies.
2. Schedules that are not strictly defined.
3. Relatively short retention of attention/focus.
4. Strong need for quick feedback.
5. Expressed desire and need for team learning and collaboration with other colleagues.
6. Prefer learning through a particular activity rather than through standard reading and writing.
7. Usage of various portable devices (Sarkar et al., 2017).

As it has been mentioned earlier, digital natives grew up in the age of digital technology development. They, therefore, deal well with digital technologies and require a learning environment that will enable them to apply them. According to Nikou et al. (2019) digital natives "spend less than 5,000 h of their lives reading, they spend over 10,000 h playing video games and almost 20,000 h watching TV" (Prensky, 2001a). This is the main reason why most modern primary schools, secondary schools, and universities are looking for a new way of organizing their teaching methods and learning techniques (Bullen et al., 2011). The main reason for such transformation is to provide a supportive and more effective learning environment for digital natives (Bullen et al., 2011).

The digital environment in which digital natives grew up is responsible for shaping the way of thinking and performing everyday tasks for digital natives (Nikou et al., 2019). In addition to shaping their characteristics, the application of digital technology has given them a kind of freedom and independence (Sarkar et al., 2017).

Therefore, digital natives are often seen as students who rely on themselves and want to plan their activities independently, i.e., not follow a schedule that someone else has strictly planned for them (Sarkar et al., 2017).

The Internet has also had a major impact on shaping behavior and thinking. Digital natives spend a lot of time online browsing websites, reading posts on various social networks, etc. The information displayed on the Internet is often "scattered." Namely, news and posts that appear on the Internet are mostly related to hyperlinks whose selections often lose the sequence of originally selected information for reading. This may be one of the reasons why digital natives do not have enough focus or enough concentration to keep their focus on just one piece of information for a long time and read it to the end (Berkup, 2014; Arkhipova et al., 2019; Tapscott, 2009). Digital natives are also able to do more than one thing at a time (Nikou et al., 2019; Judd, 2018) which also reduces their ability to stay focused on just one activity for longer (Berkup, 2014; Arkhipova et al., 2019; Tapscott, 2009). This can be greatly facilitated, for example, by the simultaneous reading of news on a computer and correspondence via a particular social network.

The next characteristic of digital natives that demands changes in educational systems is digital natives' requirements for quick responses or feedback. The reason for such requests can be in the daily use of the Internet, various social networks, digital tools, etc., which allows them to access any information at any time (Sarkar et al., 2017). According to Jarrahi and Eshraghi (2019), members of digital natives are devoted users of social media and various applications for instant messaging such as Facebook Messanger, WhatsApp or Viber applications, which can be additional motivation why they have needs for getting feedbacks as soon as it is possible (Jarrahi & Eshraghi, 2019). By comparison, digital immigrants will decide to send an e-mail that has a slightly longer response time by the recipient of the message than with various instant messaging applications (Jarrahi & Eshraghi, 2019).

According to Jarrahi and Eshraghi (2019), digital natives do not have problems with sharing information with others on social media (Jarrahi & Eshraghi, 2019). Also, digital natives often ask for their colleagues' opinion or advice (Jarrahi & Eshraghi, 2019). Likewise, they like to interact with each other (Nikou et al., 2019) and to share their knowledge with their colleagues on the personal networks (Jarrahi & Eshraghi, 2019). Consequently, the education system should adapt learning techniques by encouraging team development and the introduction of various collaborative tools and applications that will encourage mutual communication such as forum discussions, Google Hangouts, other social networks, etc., to suit Digital natives' needs.

According to Nikou et al. (2019), digital natives are defined as students who prefer "learning by doing" and "learning by experiencing." Digital natives will prefer the learning process by participating in student associations or committees (Evans & Robertson, 2020) rather than through conventional writing and reading and participation in class (Sarkar et al., 2017). In the literature, digital natives can also be observed as producers, not only consumers of the digital content, which can explain their need to actively participate in the learning process to gain new knowledge rather than only passively absorbing it (Smith et al., 2020).

Since almost all information is available on the Internet, as well as various e-editions of books, students who fall under the digital natives no longer show a desire and interest in visiting physical libraries and reading physical books (Arkhipova et al., 2019). Therefore, they rather prefer using portable devices like mobile phones or tablet to engage in learning process (Persada et al., 2019). According to the obtained results of the research made by Koumachi (2019), digital natives prefer remote lectures and reading digital learning materials on different digital devices rather than reading the same material on the paper. Thereby, schools and universities should include mobile devices and other digital devices that could support digital native students in gaining new knowledge through searching digital documents like electronical books, electronical articles, etc. (Persada et al., 2019).

5 Methodology of the Empirical Research of Digital Literacy of Digital Natives

This part of the chapter provides an overview of the part of the longitudinal empirical research that is being conducted each year since 2013 at the Faculty of Economics & Business, University of Zagreb, Croatia for the students of the first year of both Business and Economics study programs. The surveyed students can be, by their birth year, age, and characteristics, considered to be digital natives as they are both Millennials and Generation Z (Judd, 2018). However, some authors, like Cruz and Díaz (2016), argue that only Generation Z (born from 1997 till 2010) can be considered to be true digital natives. Therefore, for the purpose of this study, two different generations of digital natives are going to be taken into consideration, those surveyed in 2015, since they can be considered to be the first generation of Generation Z participating in the research, and those surveyed in 2020, as the last one participating since there are yet no results from the new 2021 academic year in the moment of writing this chapter.

The main aim of the named research is to assess the attitudes of students towards learning IT, their usage of modern tolls such as Google tools and Microsoft Office tools as well as the levels of their digital literacy. This research is being conducted each year at the beginning of the academic year, when students are asked to voluntarily complete an anonymous survey within the first 2 weeks of their studies.

In the continuation of this part of the chapter, first, the data collecting procedure is going to be presented, followed by the detailed description of the research instrument used to conduct the empirical research provided in this part of the chapter. Furthermore, the samples have been provided and discussed, as have the methods of data analysis that have been used to deliver and evaluate the study's conclusions.

5.1 Data Collection Process

As already mentioned, a study of both Business and Economics study programs students' digital literacy levels and their attitudes toward learning IT, as well as the level of their usage of modern technological tools was conducted at the start of the academic year, during the first 2 weeks of the winter semester. The questionnaire was provided to the whole generation of the first-year students by their Business Informatics teachers via Google Classrooms, but, as previously mentioned, their participation in this research was entirely voluntary.

This chapter shows the findings of two surveys that are identical by their questions. The first, which surveyed the first generation of Generation Z students, was conducted at the start of the academic year 2015/2016, while the second was conducted at the start of the academic year 2020/2021. Having in mind the current situation in the world regarding the COVID-19 pandemic, it is significant to emphasize that first generation of Generation Z students spent their whole education in physical classrooms, whereas surveyed Generation Z in 2020 enrolled in their first year at the university following a semester of online learning during their senior high school year.

5.2 Research Instrument

For the purpose of this research, a methodology developed by Ng (2012) has been utilized to investigate the levels of digital literacy among the population under investigation, i.e., digital natives. Besides the already set framework for assessing the attitudes towards learning IT and determining the levels of digital literacy, the work of Ng (2012) also served as an inspiration for developing another set of questions regarding the usage of modern tools such as Microsoft Office and Google tools.

The previously named framework, as developed by Ng (2012), is comprised of seven questions that are used to examine respondents' attitudes towards studying IT. A 5-point Likert scale was used to determine how much agreement respondents had with each of the statements. The lowest number, i.e., grade 1 reflected the most degree of disagreement, while the highest number, i.e., grade 5 signified the greatest degree of agreement. Table 2 presents the research instrument that has been used to evaluate the attitudes of the surveyed students towards learning IT.

Next, as previously described, the Ng (2012) digital literacy framework also includes statements that address the three dimensions of digital literacy that have been described earlier, being technical dimension, cognitive dimension and social-emotional dimension. There was a total of ten statements in the research instrument regarding digital literacy as presented in the Table 3. Each statement was graded on a 5-point Likert scale, with 1 representing total disagreement and 5 representing total agreement (Table 3).

Table 2 Attitudes towards IT learning research instrument (*Source* Authors' work, 2021 following Ng, 2012)

Dimension	Statement ID	Statement
Attitudes towards IT learning	ATT1	I like to use IT in the learning process
	ATT2	I learn better with the help of IT
	ATT3	IT makes learning more fun
	ATT4	I have more motivation to learn with IT
	ATT5	IT allows me to learn on my own initiative and independently
	ATT6	The use of mobile technologies for educational purposes has a lot of potential
	ATT7	Teachers should make more use of IT in the educational process

Table 3 Digital literacy research instrument (*Source* Ng, 2012)

Dimension	Statement ID	Statement
Technical dimension	TD1	I know how to solve my technical problems on my own
	TD2	I easily learn to use new technologies
	TD3	I follow the development of new technologies
	TD4	I have knowledge of a wide range of technologies
	TD5	I possess technical skills in using IT to present my knowledge
	TD6	I have good IT skills
Cognitive dimension	CD1	I am confident in my Internet search skills in terms of getting quality information
	CD2	I am familiar with problems related to the use of the Internet (e.g., security issues, plagiarism, piracy)
Social- emotional dimension	SED1	IT allows me to better collaborate with colleagues on various projects and other educational activities
	SED2	I often ask my colleagues for help with teaching assignments online

The next part of the research included questions regarding the usage of Microsoft Office, and Google tools, as well as the question regarding the frequency of usage of an e-mail. There was a total of seven questions regarding the Microsoft Office tools and ten questions regarding the Google tools, as presented by the Table 4, which also presents the answers that were offered to the respondents to select. Finally, there was on question regarding the frequency of usage of an e-mail.

Table 4 The usage of Microsoft Excel, Google tools, and e-mail research instrument (*Source* Authors' work, 2021 inspired by Ng, 2012)

Question	Statement ID	Tool	Possible answers
Have you used the following Microsoft Office tool so far and to what extent?	MSO1	Word	– Never – I have heard of this tool – I have used it several times – I am using it often
	MSO2	Excel	
	MSO3	Access	
	MSO4	PowerPoint	
	MSO5	Publisher	
	MSO6	InfoPath	
	MSO7	Outlook	
Have you used the following Google tool so far, and to what extent?	GT1	Google Chrome	– Never – I have heard of this tool – I have used it several times – I am using it often
	GT2	Google Drive	
	GT3	Gmail	
	GT4	Google Sites	
	GT5	Google Keep	
	GT6	Google Calendar	
	GT7	YouTube	
	GT8	Google Translate	
	GT9	Google Scholar	
	GT10	Google Books	
How often do you use e-mail?	EM1	E-mail	– On a daily basis – Several times a week – Several times a month – Less than once a month – I don't have an email address

Additionally, the questionnaire contained demographic questions that were asked of the participants in the study, regarding their age and sex, as well as if the academic year when the survey took place was the year of their first university enrolment.

5.3 Sample

There were 384 surveyed first-year Business and Economics students in 2015, and 271 of them in 2020. In 2015, majority of the respondents were female students (75.77%) aged between 18 and 21 (93.49% of them), while 12.76% of them did not enrol the University for the first time in the academic year 2015/2016. In 2020, the majority of the respondents were also female students (74.10%) aged between 18 and 21 (97.05% of them), while 6.27% of them did not enrol the University for the first

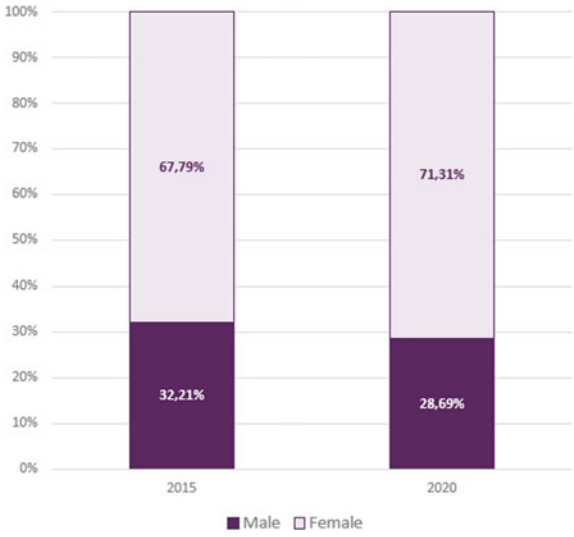

Fig. 8 Final sample sex characteristics, N(2015) = 326, N(2020) = 251 (*Source* Authors work, 2021)

Table 5 Sample Characteristics: sex, age, and first enrolment (*Source* Authors' work)

Sample characteristic		2015 N = 384		2020 N = 271	
		N	%	N	%
Sex	Male	137	42.02	85	33.86
	Female	247	75.77	186	74.10
Age	18–21	359	93.49	263	97.05
	22–25	17	4.43	8	2.95
	26–30	4	1.04	0	0.00
	31–40	2	0.52	0	0.00
	41–55	1	0.26	0	0.00
	above 55	1	0.26	0	0.00
First enrolment	Yes	335	87.24	254	93.73
	No	49	12.76	17	6.27

time in the academic year 2020/2021. The first sample characteristics are presented by the Table 5.

Since the purpose of this study was to identify the first generation of the Generation Z students, with the assumption that their first enrolment at the University should be at the age of 18, all answers that have been received by those that did not belong to the first age group (18–21) and by those who did not enrol the university for the first time in the surveyed academic year have been omitted from the further analysis. In that sense, there was a total of 326 responses left for the analysis collected in 2015, and 251 responses collected in 2020.

Figure 8 presents the sample characteristics regarding respondents' sex in the remaining sample, i.e., the one that has been further analyzed. In that, final sample, among 2015 survey respondents there were approximately 68% of female students and 32% of male ones, while in 2020, there were approximately 71% of female students and 29% of male ones.

5.4 Data Analysis

IBM SPSS statistic software and Microsoft Excel 2019 were used to analyze the data obtained by the previously described research using the final sample. The means, standard deviations, modes (in certain cases), and frequencies were computed for statements using the Likert scale.

Frequencies of distributions have also been computed for the third part of the questionnaire, referring to the frequency of usage of Microsoft Office tools, Google tools, and e-mail.

5.5 Results and Discussion

Table 6 presents the results of the descriptive statistics for both 2015 and 2020 surveys regarding the frequencies of answers on the questions related to the students' attitude towards learning IT. It is visible from the results that the first generation of Generation Z students, surveyed in 2015 have given highest grades to the item ATT7 (29%) which refers to the idea that teachers should make more use of IT in the educational process. On the other hand, this item received only 18% of the highest grade in 2020 survey, which comes as no surprise if one takes into consideration the previously mentioned fact that the 2020 students have been involved in distance learning using IT for

Table 6 Frequency of distributions for attitudes towards learning IT part of the research (*Source* Authors' work)

ID	% 2015					% 2020				
	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
ATT1	9	11	36	23	21	8	14	35	25	20
ATT2	8	17	39	20	17	10	16	37	21	15
ATT3	9	12	39	23	18	10	16	36	20	17
ATT4	9	19	40	17	14	14	26	32	18	10
ATT5	9	16	41	19	14	8	18	34	25	16
ATT6	3	6	33	29	28	1	8	27	31	33
ATT7	4	9	33	26	29	6	13	38	25	18

Table 7 Frequency of distributions for digital literacy part of the research (*Source* Authors' work)

ID	% 2015					% 2020				
	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
TD1	4	16	41	28	11	6	16	39	24	15
TD2	2	7	30	29	32	3	5	31	33	27
TD3	5	12	38	25	20	6	14	32	31	17
TD4	6	21	42	21	10	11	25	40	18	7
TD5	6	17	38	27	12	6	17	37	26	14
TD6	5	12	42	29	11	8	17	39	25	11
CD1	3	7	29	33	27	3	6	25	36	30
CD2	1	7	28	31	33	1	10	24	26	39
SED1	2	7	31	32	29	2	7	29	29	33
SED2	2	10	28	34	25	4	11	27	32	26

quite a while due to the COVID-19 pandemic and they probably strive for an "old-normal" when they had the opportunity to learn side to side to their colleagues in the physical classrooms. The results of the 2020 survey frequency distribution reveal that most of the highest grades have been awarded to item ATT6 (33%), which refers to the potential of using mobile technologies for educational purposes. Such findings corroborate prior Eurostat research, which indicated that about 75% of adults in the European Union used a mobile device to access the Internet in 2019, while 93% of young adults aged 16–29 did the same (Eurostat, 2020). The same study discovered that mobile phones were used to connect to the Internet at a far greater rate than computers (Eurostat, 2020).

Next, Table 7 presents the results of the descriptive statistics for both 2015 and 2020 surveys regarding the frequencies of answers on the questions related to the students' digital literacy. Within the technical dimension, it is visible from the results that the first generation of Generation Z students, surveyed in 2015, as well as the students surveyed in 2020, have given highest grades to the item TD2 (32% in 2015 and 27% in 2020), which refers to the ease of learning new technologies. Such results are, again, no surprise, and are in line with the characteristics of the digital natives and Generation Z, as discussed in previous subchapters.

In the cognitive dimension, higher grades have been given to the CD2 item, referring to the familiarity of the problems related to the use of the Internet (e.g., security issues, plagiarism, piracy). In that sense, both surveyed generations have given the higher grades to CD2 item, 31% of them in 2015 and 39% of them in 2020, which shows an increase in that sub-dimension of the digital natives' digital literacy. That awareness of the security issues that can occur while using Internet is, of course, a good trend, since there has been an increase in the amount of such events. As indicated by Sobers (2021), recent trends, the consequences of a worldwide COVID-19 pandemic, and cybersecurity statistics all point to a dramatic increase in hacked and

leaked data from more prevalent workplace sources, such as smartphones and IoT devices, where 95% of cybersecurity breaches have been caused by human error.

In the social-emotional dimension, both observed years reveal higher grades for the SED1 item, referring to belief that IT allows students to better collaborate with colleagues on various projects and other educational activities. Such results are in line with Kahootz (2019) statements on how the usage of IT can improve collaboration and encourage teamwork.

Figure 9 presents the mean values of items ATT1–ATT7 which comprise the construct attitudes towards learning IT. It is visible that the highest mean grades have been awarded for both surveyed years to ATT6 item, referring to the potential of using mobile technologies for educational purposes, as explained earlier. On the other hand, lowest grades have been awarded to the ATT4 item, which refers to the increase in motivation when IT is involved in learning. Again, very likely due to the COVID-19 pandemic situation which has shifted practically the whole world online, and ongoing distance learning for 2020 surveyed students, the average grade on the ATT4 item is lower in the 2020 survey results (2.83) compared to the 2015 survey results, where the average grade was 3.09.

Figure 10 presents the mean values of items referring to the digital literacy and its three dimensions. It is visible that the highest mean grades within technical dimension have been awarded for both surveyed years to TD2 item, referring to the ease of learning how to use new technologies, as explained earlier. On the other hand, lowest grades have been awarded to the TD4 item, which refers to the knowledge of a wide range of technologies. Such results can be explained by the increasing and rapid development of new technologies every day, so digital natives are, according to these results, well aware of the fact that their knowledge of a wide range of technologies is scarce and limited in comparison to the actual range of available technologies nowadays.

As presented by the Fig. 10, in the cognitive dimension, higher average grade in both observed years have been appointed to CD2 item, referring to familiarity with problems related to the use of the Internet (e.g., security issues, plagiarism,

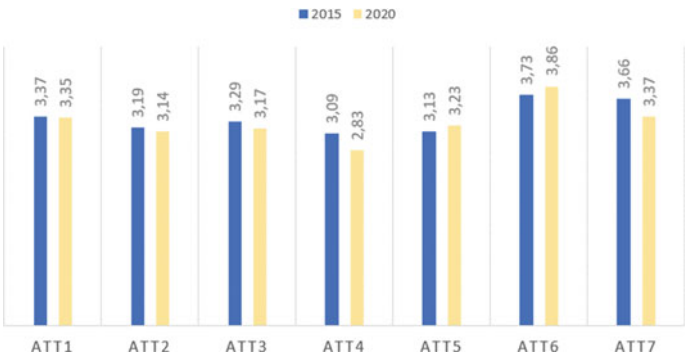

Fig. 9 Mean values of attitudes towards learning IT items (*Source* Authors work, 2021)

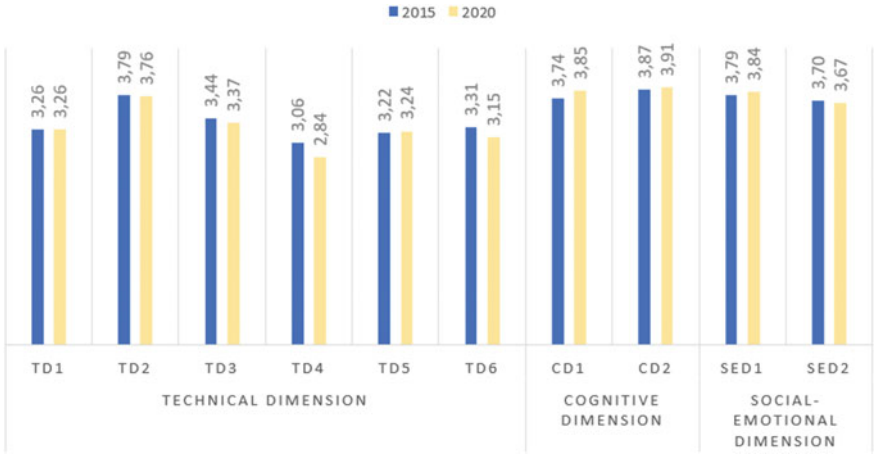

Fig. 10 Mean values of digital literacy items (*Source* Authors work, 2021)

piracy), while lower grades have been appointed to the other item, CD1, referring to the confidence in the Internet search skills in terms of getting quality information. However, for both items, the average grades are slightly higher in 2020 than in 2015 research results.

When it comes to the social-emotional dimension, higher average grade in both 2015 and 2020 research is given to the SED1 item, referring to belief that IT allows students to better collaborate with colleagues on various projects and other educational activities, while lower ones have been given to other item, SED2, referring to seeking colleagues for help with teaching assignments online. While the higher average grade for the SED1 item has been given by the 2020 students in comparison to 2015 ones, there is a reverse situation when it comes to the SED2 item, where 2020 students have given slightly lower average grade to it than 2015 students. One of the possible causes could, again, be found in COVID-19 pandemic, since the 2020 students have not met in person after their university enrolment, so it is probably harder for them to reach out to colleagues than if they know each other in person, and not just virtually.

Having in mind previously showed results regarding attitudes towards learning IT and digital literacy of different two generations of digital natives, it can be concluded that their attitudes are changing over the years, but the level of their digital literacy remains fairly on the similar path.

The next part of the research has been focused on the frequency of usage of Microsoft Office tools and Google tools among digital natives. The results are presented in the Table 8, where 1 represents "Never," 2 represents "I have heard of this tool," 3 represents "I have used it several times," and 4 represents "I am using it often." As it is visible from the results, most often used Microsoft Office tool is Word (item MSO1) with 85% of 2015 students, and 84% of 2020 students using it often. The next most frequently used one is PowerPoint (item MSO4), which is been

used often by 75% of the digital natives surveyed in 2015, and 82% of them surveyed in 2020. The least used Microsoft Office tool is Microsoft InfoPath (item MSO6), which has never been used by 50% of the digital natives surveyed in 2015, and 67% of them surveyed in 2020. The next least used Microsoft Office tool is Publisher (item MSO5), which has never been used by 29% of the digital natives surveyed in 2015, and 43% of them surveyed in 2020.

When it comes to Google tools, the most frequently used Google tool for digital natives surveyed in 2015 has been YouTube (item GT7), with 96% of them using it often, followed by Google Chrome (item GT1), which has been used by 92% of 2015 surveyed students. In 2020, most of the digital natives, 97% of them voted YouTube to still be the most used one, while the second most frequently used Google tool is Gmail (item GT3), with 95% of 2020 digital natives using it often. On the other hand, the least used Google tool for digital natives in 2015 has been Google Keep (item GT5), with 40% of them have never use it. In 2020 research, the least used Google tool among digital natives has been Google Scholar (item GT9), as 49% of students have never used it (Table 8).

Finally, regarding the frequency of the usage of an e-mail, the results are presented by the Fig. 11. As it is visible from the results, there has been an increase in the frequency of usage of e-mails if one compares the results of the survey that have

Table 8 Frequency of distributions for the frequency of usage of Microsoft Office tools and Google tools (*Source* Authors' work)

Statement ID	% 2015				% 2020			
	1 (%)	2 (%)	3 (%)	4 (%)	1 (%)	2 (%)	3 (%)	4 (%)
MSO1	0	1	14	85	0	0	14	86
MSO2	2	8	64	27	0	11	69	19
MSO3	13	41	43	3	17	47	35	1
MSO4	0	1	24	75	0	1	16	82
MSO5	29	52	17	3	43	45	10	2
MSO6	50	45	4	1	67	30	2	1
MSO7	13	40	30	16	24	49	23	4
GT1	0	1	7	92	0	0	6	93
GT2	14	32	33	20	3	17	42	38
GT3	1	2	9	88	0	1	4	95
GT4	21	38	21	20	22	39	22	18
GT5	40	40	16	5	41	47	10	2
GT6	22	44	23	11	19	38	30	14
GT7	0	1	3	96	0	0	3	97
GT8	1	2	17	79	0	1	21	78
GT9	36	44	16	4	49	32	12	7
GT10	30	50	16	5	41	41	14	4

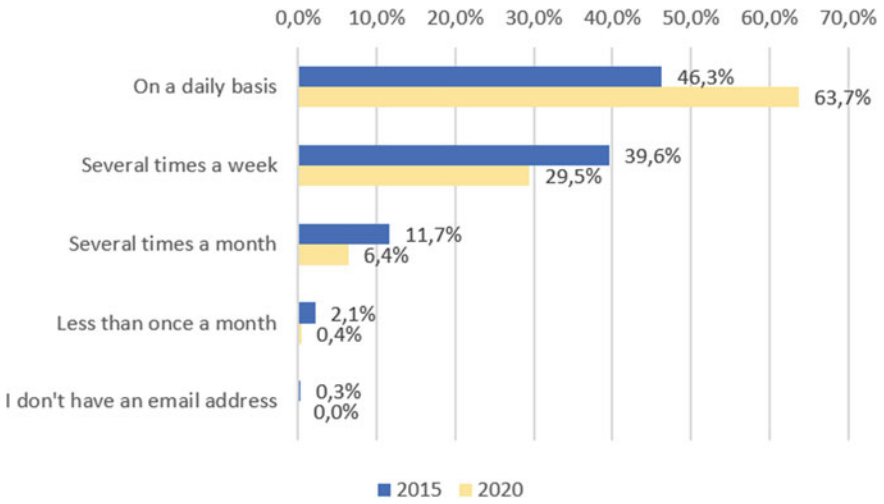

Fig. 11 Frequency of an e-mail usage among digital natives (*Source* Authors work, 2021)

been obtained in 2015 and those that have been obtained in 2020. In 2015, 46% of digital natives have been using e-mail on a daily basis, while approximately 40% of them have been using it several times a week. Also, 0.3% of digital natives in 2015 voted that they do not have an e-mail address, where in 2020 there are no students who have selected that option. In 2020 survey, there has been an increase, and now approximately 64% of digital natives use e-mail on a daily basis, while approximately 30% of them use it several times a week. Only 6.8% of students surveyed in 2020 use e-mail several times a month or less than once a month.

6 Conclusion

This chapter discussed the theoretical framework of digital natives and the methods and findings of an empirical study that has been carried out among two generations of digital natives, where one generation has been surveyed in 2015 as the first generation of Generation Z and one has been surveyed in 2020. The primary objective of this empirical research was to ascertain the degree of digital literacy of students who can be considered to be digital natives, as well as their attitudes about learning IT, and the frequency of their use of current tools such as Google tools, e-mail, and Microsoft Office tools. The results have shown similar trends in the levels of digital literacy of surveyed digital natives, but there is a shift in their attitudes towards learning IT. Also, when it comes to the usage of Microsoft Office and Google tools, similar trends have been noted, while, when it comes to the frequency of usage of an e-mail services, an increase has been found in 2020 in comparison to 2015.

Although the empirical research presented in this chapter contributes to the corpus of knowledge, it does have certain limitations that must be acknowledged. For example, all of the digital natives that have been surveyed are first-year students of Business and Economics study programs, which means that the findings may vary for different majors. Also, this research has been conducted in Croatia, which limits the possibilities for generalization. Additionally, one should be mindful that utilizing a different framework and research instrument may result in very different findings and insights.

For further research, authors propose that this kind of survey is conducted on a sample of students of other majors, as well as outside of Croatia in order to increase the generalization of the findings and allow their comparison. In addition, as this chapter provided an overview of the research results, further statistical tests need to be performed in order to see if the noted differences between the digital natives of the first generation of Generation Z surveyed in 2015 and those surveyed in 2020 are statistically significant.

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The Use of Gamification in Training and Socialization Processes in a Multicultural Context

Andrezza Fernandes, Márcio Melo, and Carolina Feliciana Machado

Abstract This work begins with a historical context in order to introduce the multicultural organizational context, passing through the evolution of the human resources management functions over time. We also present the concept and some pertinent issues regarding conflicts. That said, the concepts and reasons for using gamification in training and socialization processes are defined and worked out. We conclude at the end that the issues of gamification, such as the playful, creative and exciting environment, tend to enhance the results of the training and socialization processes, since both processes aim at the development and integration of employees. We also point to the benefits that this methodology can bring, such as stress relief and easier socialization, since people are more willing to socialize in a less formal environment. And finally, we point to the resilience of this methodology, since it is considerably malleable to the social, organizational and cultural context, as well as the intensity and variety of tools that are not mutually dependent.

Keywords Gamification · Training · Socialization · Multicultural context · Human resources management

1 Introduction

Today we live in a globalized world. Borders are very thin and both people as individuals and organizations move more easily between countries. At the level of organizations, this greater mobility leads to higher levels of competitiveness. In fact, if in the past, organizations were more concerned with their local competitors, which were under the same economic and social conditions, nowadays, competitors may be on the other side of the world in a different and probably more advantageous context.

A. Fernandes · M. Melo · C. F. Machado (✉)
School of Economics and Management, University of Minho, Braga, Portugal
e-mail: carolina@eeg.uminho.pt

C. F. Machado
Interdisciplinary Centre of Social Sciences (CICS.NOVA.UMinho), University of Minho, Braga, Portugal

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One of the solutions found to increase competition was the internationalization of the organizations' operations in order to take advantage of competitive advantages that some locations offered, such as lower labor costs, better tax rates, among others. Cerceau and Lara (1999) emphasize that there is a broad learning process in the organization's internationalization, arising from competitive advantages or from the sale of products or services.

At first, the problems with the cost and effectiveness of production were solved, although another problem of a more complex and delicate nature was emerging. With the internationalization of organizations and consequently the internationalization of their human resources, difficulties emerged in managing conflicts arising from this multicultural context. To Chiavenato (2002), the conflict arises not only when there is a clash of opposing ideas, feelings or interests, but also when one of the parties realizes that the other intends to interfere in the achievement of their goals. In this context, Schmidt and Kochan (1972) point out two prerequisites that can increase their intensity in these clashes between cultures: the incompatibility at the level of perceptions of goals that is characterized by the lack of understanding of the goals of both sides and the perceived opportunity to block or interfere, thus creating obstacles to the achievement of goals.

As soon as the human resources department became a strategic sector within organizations, it became necessary to explore methods and practices that aim not only to manage their employees well, but to obtain their maximum potential to achieve the organization's objectives. This became one of the main competitive differentials. Armstrong (2008) understands the strategic role of human capital so that the organization can achieve success and also emphasizes that they are a source of competitive advantages.

A series of new activities, such as attracting and retaining talents, recruiting and selecting more and more carefully according to the organization's strategy, training and development of both technical and behavioral skills, are then under the responsibility of the human resources department.

From an organizational point of view, conflict management is vital, as, as mentioned, they are obstacles that make it difficult and, in some more extreme cases, make it impossible to achieve the established objectives. In addition, most of the time, making the process more costly and consequently less effective. Anna Burbridge and Marc Burbridge (2012) point out in their book 'Gestão de conflitos: desafios do mundo corporativo (Conflict management: challenge of the corporate world)', seven types of hidden costs that can be caused by internal conflicts, namely lost time cost, opportunity cost, reduced motivation, cost of bad decision, cost of acts against the company, cost of lost talent, and cost of unnecessary relocation. The authors also highlight the ripple effect that can arise due to the high frequencies of these conflicts, such as high rates of absence, accidents, and health problems.

Excessive conflict tends to negatively affect the performance of tasks, which in turn can lead to a reduction in the quality of the service and/or product, generating a decrease in market competitiveness. In short, we can say that the critical point for achieving success is often human resources, which in turn are directly affected

by conflicts. In many cases, when conflicts are not managed correctly, they can jeopardize the entire operation or even the organization's survival.

According to Fraga (1993), being able to verify the existence of the conflict is only part of the problem. Therefore, it is also necessary to know the severity and how to manage it properly. Both authors Dimas et al. (2005) and McIntyre (2007), point out that the critical point for effective conflict management lies in the competence that the mediator will have to manage the conflict itself. In the business context, the manager tends to be the mediator, as it is he who, in theory, has the power and adequate training to do so.

It is important to emphasize that conflicts are relevant for the effective development of the organization. According to Cunha, Rego and Cardoso (2007) a moderate level of conflict is needed, as it contributes to promote innovation and creativity in the organization. This way conflict is seen as contributing to the improvement of the quality of decisions and increasing the organization' performance. On the other hand, an organizational environment characterized by high levels of conflict tends to increase stress and chaos, making it difficult the existence of cooperation and coordination among collaborators. Finally, the existence of a low level of conflict, tends to create an apathetic environment, leading to a lack of effort and motivation.

Considering this context, the methodology that will be analyzed in this chapter will be gamification, because, as Menezes and Oliveira (2016) conclude in their systematic review, this tool is being adopted in a variety of contexts and areas. Useful to reduce the existent stress and tension resulting from high levels of conflict, gamification assumes itself as an interesting tool to be studied and analyzed in a multicultural organizational environment.

More specifically, we will analyze how gamification can be used by human resources management (HRM), but it is noteworthy that this tool can and should be used in any sector within organizations, such as marketing, commercial, and even production.

The use of gamification as a methodology not only in an educational context, but also in an organizational and even cultural context, has been expanding faster and faster. For Gama, Silva and Cruz (2014), games can be considered a cultural phenomenon having been researched by several areas such as education, communication, psychology, design and computing. That said, we can infer that the growing use of games tends to make it easier for young people to adapt to a methodology based on the same principles as games, which is already considered a cultural phenomenon.

The use of gamification in a business context has been around for at least 60 years. In the 1950s, for example, management simulators already existed with the aim of training new professionals. Since then, its use has intensified, especially after the expansion and democratization of the internet.

Zichermann and Cunningham (2011) present in their book 'Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps' four reasons that motivate people to play games: to master a certain subject; relieve stress; as a form of entertainment; and as a means of socialization. Analyzing these four reasons, we can relate the use of gamification to the training and socialization processes, since the training process aims at learning a certain subject and the socialization process

aims to create good relationships between employees, preferably, with low levels of stress. The same authors also highlight the effectiveness of environments that interact with the emotions and desires of users for the engagement of the individual, which is a factor of great importance in both HRM processes.

It is important to highlight that the main aim of this tool is not to consider a business process as a joke, but to get the most out of the employee's engagement at the same time it will be possible to proactively combat the existence of possible excessive conflicts.

2 Gamification

According to Gama, Silva and Cruz (2014), gamification provides learning environments mediated by challenge, pleasure and entertainment. We can say that the use of game elements, which will be described later, can be used in different scenarios, from an educational to a business context, since the challenge, pleasure, and entertainment can generate greater engagement of those involved with the context. To Busarello, Ulbricht and Fadel (2014), gamification as an emotional influence, as it has an emotional influence by involving the user in the performance of various tasks. So, in order to achieve these goals, it is important to understand the game mechanics to apply them efficiently.

Johnson, Laurence and Smith (2006: 17–18) present four types of games that are being researched for possible learning applications. The most common game types mentioned in their report are

- Simulation or role-playing: also known as RPG (Role Playing Game), are based on the imitation of a real process or role-playing, such as flight training, surgical procedures and even a reenactment of a trial, where students interpret lawyers and judges;
- Virtual environments: regarding the virtual system, it tends to be more and more detailed with beautiful images and a lot of interactivity, since the gamification methodology can be applied in a virtual environment or not;
- Social and cooperative games: online or not, refers to the interaction with other players, whether these interactions are competitive or cooperative. The games known as MMO (Massive Multiplayer Online), that is, game mode where multiple players participate and interact in the same environment, has become a big trend in the gaming world;
- Alternate reality games: these combine real and online experiences. While part of the game takes place in a virtual environment, the other part of the experience requires the player to perform some activity personally, which generates greater interactivity.

The authors believe that, not only for new generations, but for all ages, the engaging power of games is the factor that marks gamification as a discipline of special importance for education.

Gamification is often used in our daily lives without we knowing it. For example, when a child is playing with wooden blocks and constructing small buildings, he/she is not only playing, he/she is also training his motor skills and dimensional notions while having fun.

Not only children, but some adults also use gamified techniques such as flight simulators to train future airplane pilots. In the latter case it may seem less fun than the first example, however, there are already commercialized games that simulate the commands of an airplane, among them the Microsoft Flight Simulator X, which allows users to fly from gliders to large planes and travel to various places through the virtual world.

Fadel and Ulbricht (2014) point out some more examples of the use of this applied methodology, such as in kindergarten through the reward with little stars when a certain task is performed or when the words of a dictation were getting more difficult. In other words, gradually increasing the difficulty in adapting to the individual's abilities.

We can also cite business simulators as another example of a gamified teaching process that has been widely used in educational institutions to help students understand how some sectors and processes within a company work. Usually in these simulators, students are distributed in small groups to manage a company in a fictitious market. Although it seems complex, this type of simulator can be adapted for both university management students and secondary school students. In the first case, the aim is to dynamically consolidate the knowledge and concepts learned in the classroom, while in the second case the aim is to introduce concepts such as entrepreneurship, financial management and the issue of supply and demand for future professionals.

In a way, we can say that to apply gamification in any process, be it a day-to-day process or an organizational process, it is necessary to carry out a structuring or mapping of this process. Thus, it will be possible to see which points and steps are fundamental and which gamified mechanics are best adapted to each step of the process. With this level of planning, it is simpler to analyze and decide certain questions regarding the application of the methodology, such as which technology (virtual or analog) is more effective in each case. It is also important to point to the definition of clear goals that it proposes to achieve using this methodology, whether the goal is to socialize, or just relieve stress, or just instigate the competitive side of users. Each context has a specific objective that must always be aligned with the organization's objectives.

In addition to the educational factor, gamification is also used in the socialization process, as well as to relieve stress and as a motivational factor. Without omitting the entertainment factor, Marshall McLuhan (1972) sees no difference between entertainment and education and complements his reasoning by stating that teaching that pleases has always been more effective.

Mark Prensky (2001) has formulated a list of 12 reasons to adopt gamification as follows:

1. Is a way of fun that allows enjoyment and pleasure;
2. Has rules that allow structure;
3. Has goals that facilitate motivation;
4. Is interactive that force to work;
5. Is adaptive and allow for evolution;
6. Has results and feedback that allow learning;
7. Has multiple levels of victory that provide satisfaction and self-confidence;
8. Has problem solving that increase creativity;
9. Has interaction and this simulates social groups;
10. Games are ways to play. Enables intense and passionate participation;
11. Has representation and history and this generates emotion;
12. Has conflict, competition, challenge, opposition and it gives adrenaline.

Other authors also point out the various benefits generated by the use of gamification. In addition, Andrade (2012) draws up a list of issues that games make it possible to learn:

1. Behaviors through imitation, feedback and practice.
2. Creativity through play and action.
3. Facts by associating, memorizing, exercising and answering questions.
4. Critical capacity for analyzing cases, formulating questions, making choices, receiving feedback and training.
5. Languages by imitation, practice and emergence.
6. Observation for the example and attention to the feedback received.
7. Procedures for imitation and practice.
8. Processes by systems analysis, deconstruction and practice.
9. Systemic view by discovering the principles and understanding the hierarchy of tasks.
10. Reasoning through puzzles, problems, and examples.
11. Skills (physical or mental) through imitation, feedback, continued practice and facing new challenges.
12. Public speech and presentations by memorization, practice, and training.
13. Theory through logic, explanation, and questioning.

All these motives reinforce the importance of expanding the use of gamification. As highlighted in their research, Silva, Sartori and Catapan (2014) observed that users of gamified systems have more significant results compared to users of non-gamified systems, producing activities faster and more efficiently. These conditions were also found to be pleasant, fun, engaging and effective.

Busarello, Ulbricht and Fadel (2014) also point out that gamification starts from the concept of stimulating action to think systematically as a game. The underlying objective here is to seek to solve problems, improve products, processes, objects and environments, promoting the motivation and engagement of a certain audience.

Although this methodology is increasingly in evidence, as suggested by this author, an important issue to be considered for application in an international context arises: cultural diversity. How to apply the same methodology in a multicultural context and obtain a satisfactory result?

Each culture has its own ideals, values and meanings for different attitudes. While in some cultures people shake hands with each other, in others people keep a distance and bow to each other. So how to democratize gamification within organizations as a solution for greater employee efficiency?

To better analyze this issue, it is necessary to conceptualize and correlate two points: game mechanics in gamification and the multicultural organizational context.

2.1 Game Mechanics in Gamification

In this section, the main game mechanics used in the Gamification methodology will be presented. As several authors specify different characteristics of a game that can be used in a gamification context, a single model was selected, the one that was considered more complete, to aid the analysis of this report.

The model by Zichermann and Cunningham (2011) was chosen, which describes nine tools, which are not necessarily applied to any gamified process, but demonstrate a series of relevant aspects that can be explored in different intensities depending on the context. The nine tools are points, levels, scoreboard, chevrons, integration, challenges and missions, engagement loops, customization and reinforcement, and feedback. Which will be explained below.

The point system is a multifunctional element. It can be understood as an indicator where both the user and the developer can follow the user's results in the process.

In a way, similar to the point system, there is the level system. The levels are stages, where the difficulty is always increased, in order to promote growth and progress within the system and providing satisfaction and self-confidence to the user.

While the points system is intended to perceive the results themselves, the scoreboard adds to it the concept of comparison. In other words, the scoreboard presents the user's results in comparison to the obstacles passed or not, or in comparison to the results of other users.

Chevrons are symbolic components. They are usually termed as achievements, feats, or badges. They do not increase the difficulty level or add points. Its purpose is to mark the achieved goals, point out the progress within the system, generate engagement between the user and the system and even encourage social promotion.

Integration is related to the user's interest in continuing to use the system. That is, it is what will decide whether a new user will continue to play or not. There are several strategies used by developers to increase integration, such as creating an easier starting environment to avoid user failures or using positive reinforcement to encourage the user to continue.

Challenges and missions are objectives established by developers that will act as a guide for activities to be performed by users, keeping them busy and increasingly

involved with the system. Usually simple and more common missions are created in order to teach by repetition and more complex and occasional challenges that require greater creativity and user skill to be solved.

We can point out engagement loops as an evolution of integration, as they aim to maintain user engagement. In other words, if the initial integration convinced the user to keep playing, in the future there will have to be moments to reinforce the interest and motivating emotions so that the user does not abandon the system. An example often used as an engagement loop are events that usually feature new stories, new missions and challenges, and even opportunities to level up that would only be possible by participating in the event.

Customization refers to changes or transformations of settings, items or characters that the user has the option to change. This is normally a visual feature and does not interfere with the rest of the system. However, care must be taken when exploring this feature, as too many options or too few options can discourage the user. A solution for this is to make this tool available gradually.

Reinforcement and feedback are essential tools, as they indicate to the user where he is in the environment and the consequences of his actions. This role is often played by a helper, or a character who accompanies the user from the beginning of the process, or a mediator who assists the user directly.

It is noteworthy that it is not necessary to use all these mechanics in any gamified process. The strength of gamification is its versatility, since it is possible to use one or more mechanics in different contexts, for people of different ages, individually or in groups. Each context will need an adaptation in the application of this tool.

In summary, we can say that resilience in gamification artifacts provides adaptability to different contexts, which can be considered a great advantage. Macedo (2010) corroborates by highlighting the need for more flexible and adaptable systems for the dissemination of knowledge.

3 Multicultural Context

We then move on to the next base topic for greater understanding. Before properly defining the phenomenon of the multicultural context, we must start with the basic concept of culture.

Culture can be defined "[…] as the complex set of beliefs, customs, knowledge, habits and traditions shared by the members of a society, transmitted mainly from generation to generation" (Cardoso, 1996: 15). While Cunha (2014: 12) points to culture as "[…] a set of individual and social ideas, behaviors, symbols and practices, learned generationally."

However, with the advent of globalization, culture has become increasingly dynamic, while societies are increasingly pluralistic. Even though it is constantly changing, the culture maintains many issues of its essence. In this scenario, both technological advances and the spread of new means of transport have contributed

to people from different cultures starting to gather in a multicultural environment in ever greater proportions.

During the last years, the world is facing a critical social phenomena, as is the case of immigration, which contributes significantly to the existence of a multicultural environment. Oscillating between the search for better living conditions and obtaining new knowledge and perspectives, this is, without a doubt, a phenomenon that has been exerting a strong impact on today's society. In addition to this, another phenomenon that contributes to the existence of multicultural societies is expatriation. For Rei de Sá (2010) international HRM assumes expatriation as a critical issue, with a view to sending employees to international projects.

Therefore, there is not just one factor for creating multicultural environments, but several. Each one with its positive and negative points. But what interests us to understand at the moment is the importance of international HRM for the management of these progressively more abundant multicultural resources and the fact that multicultural societies are increasingly a global trend.

In addition to the national culture, we can also point to organizational culture as a variable that directly interferes in the application of gamification. According to Schein (1985: 18), "The culture of a group can now be defined of the shared basic assumptions learned by a group as it solved its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems." With this in mind, we can point out the importance of organizational culture with regard to the application of gamification in a business context.

So, we can say that in addition to the cultural challenge at the national level, there is also the challenge of adapting gamification to the corporate context, having its organizational culture as a parameter.

3.1 Multicultural Organizational Context

In recent decades, we have experienced an evolution, both in terms of technology and in terms of management studies. And in this globalized context, organizations have significantly advanced in the process of internationalization of human resources. Including, distinguishing HRM from international HRM.

Taking cultural differences into account, organizations are faced with a new problem, the conflict generated by the clash of cultures. However, contrary to common sense, conflict is not necessarily a bad thing, it can be quite positive depending on the context and level of the conflict, considering that the absence of conflict can discourage and the excess tends to harm employees' activities.

So, we've come to the point where conflict doesn't need to be eliminated, it needs to be managed. One of the functions of international HRM is conflict management, and more specifically the management of cultural differences. Managing human

resources, always unique, multicultural, and working together to achieve the same goal will always be a challenge.

As pointed out by Sousa (2015), the way the conflict is managed will provide advantages or disadvantages and its results will always affect two variables: the individual and the organization as a whole. That said, we can see the importance of international HRM (IHRM) in conflict management for the overall performance of organizations. However, our aim in this chapter will not be to specify the advantages or disadvantages of conflict, but just to know that they exist and can be managed.

Still on conflict, Souza and Almeida (2014) understand that the origin of conflicts originates in the particular diversities of each individual, from their perception of everything around them to their way of acting and thinking. Therefore, we can say that one of the causes of conflict may be cultural differences.

4 International HRM Functions

Armstrong (2008) argues that to obtain a sustainable competitive advantage, strategic HRM must have qualified, engaged, and motivated employees.

HRM has several processes that support the achievement of the organization's goals, such as recruitment and selection, strategic planning, control of labor relations, internal communication, performance evaluation, training, and development, among others.

Comparing IHRM functions with those of HRM, we can say that they are very similar. Indeed, the distinction between them is related with two dimensions more that we need to add. In other words, in addition to those activities IHRM also considers the country where the organization operates (home country, host country and a third country), and the collaborators it uses (expatriates, host country employees, and third country employees). Based in this complex framework, and following Adler and Ghadar (1990) perspective it is necessary to find a balance between the organization's international environment, its strategy, HR policy and implementation.

Among the activities of IHRM, training and socialization were selected as the target of this study and the support that gamification can provide in proactive combat against these possible multicultural conflicts.

4.1 Training

The use of the term "training" in the organizational context tends to be associated only with the technical development of professional skills. Although this process must consider personal and social progress, that will later somehow relate to job functions (Bernardes, 2008).

According to Goldstein (1980), training can be understood as the acquisition of skills, concepts or attitudes leading to higher levels of performance. Complementing

this reasoning for an organizational perspective, we can add that training is developed in the company's locations and carried out by a person who has the status of worker or employee (Viet & Jean, 1988).

Therefore, we can infer that the main objective of employee development for the organization is the training of technical, personal and social skills to achieve the organization's goals, generate value and competitive advantage. It is important that the assessment of the needs of these improvement processes is carried out proactively and must be linked to the organization's objectives, considering that they tend to have a high monetary and time cost. In this way, training supports more prepared employees, both for imminent needs and for needs that have not yet been identified.

4.2 Socialization

HRM resorts to socialization in order to provide an effective integration that promotes the broad development of the hired professional (Cooper-Thomas & Anderson, 2002). Completing this concept, Pascale (1985) highlights the importance of establishing goals that satisfy the organization and the new hire based on attitudes, habits and values, enabling an environment of cooperation, integrity, and communication.

According to Cooper-Thomas and Anderson (2006), we can infer that the concept of socialization is the transformation of a new employee into an internal employee that is effectively welcomed, adapted, and integrated into the organization. Likewise, we can highlight that socialization is the structured organizational process of admitting external elements to become internal and active members of organizations (Feldman, 1976).

According to Madlock and Chory (2014), organizations should be concerned with the socialization of their collaborators, in view of the reinforcement that this practice promotes in the strengthening of culture. The same author also highlights the positive correlation of this action with organizational commitment, involvement with work and the reduction of ambiguity.

Another way to analyze socialization is to visualize an organization as a group of professionals who work in relative harmony, where the engagement among employees has a significant impact on the company's result, since the individual result of everyone contributes along with a series of other processes for the final result of the organization. And every time a new employee is incorporated into this context, there is a need to adapt not only for new employees, but also for more experienced ones.

Therefore, we can infer that the main objective of socialization for the organization is the adaptation, reception and integration of employees to the organizational context, providing a favorable environment to extract the employee's potential both individually and as a team result.

5 Gamification in a Multicultural Context

The article 'Game-Based Learning Interventions to Foster Cross-Cultural Care Training: A Scoping Review' (Pimentel et al., 2020), published in Games for Health Journal, focuses on presenting other published works about educational games with the aim of promoting health care training in an intercultural context.

In short, this work highlights the importance of cultural competence for professionals, specifically in the health area, since cultural differences between these professionals and their patients can reduce the effectiveness of health services. But we can say that this point is valid for other professions as well, from educators to tourism professionals. Any professional who is close to a multicultural context needs cultural skills to make their actions more effective.

This article points out some games that were used in the training context to develop cultural skills, namely, BaFá BaFá, Barnga, Fydlyty, HealthCare DIVERSOPHY, Take a risk? Virtual patient system, Ecotonos, and Multiplayer cultural competence serious game, OWARE, MOSHI, Game-Based Cognitive Behavioral Group Therapy, and Breast Care Bingo.

The researchers recommend in their article that the use of games in the context of multicultural training be carried out in a complementary way. That is, not only applying the game, but also involving prior knowledge of the subject, some face-to-face training such as theoretical class or classroom discussion and the game itself. This is to make the training developed more effective.

To conclude this quick review, we can point to two conclusions that researchers have reached that matter to us at the moment. The first one is that the results of this article point to educational games as effective processes, and have in consideration their involving aspect for health care training in a multicultural context. And the second one refers to the advantages of the simulation and role-playing or RPG type game, since this type of game replicates real-life situations, where players are placed in often conflicting situations.

Based on this study, we can highlight the potential that role-playing games and simulations have for training, specifically, conflict resolution, since this type of game proposes that players put themselves in a specific role or situation and take attitudes of according to the context presented. We believe that many conflicts can be managed well when one or both parties are willing to think from a new perspective.

5.1 Gamification in the Training Process

Obtaining mastery of a certain subject is the basis for training, considering that this is the final objective for the employee to be able to effectively perform its functions. The other three reasons of Zichermann and Cunningham (2011) also positively influence training, enabling a pleasant environment for obtaining knowledge.

Mark Prensky's (2001) list impacts training in three distinct ways. The first is the creation of an environment conducive to learning, when the author emphasizes that gamification is a form of fun that allows enjoyment and pleasure and has rules creating its own structure.

Another form of impact on training is the encouragement of learning, enabling an easy and pleasant absorption of knowledge. Goals, results and feedback and mandatory interaction reinforce the stimulus for the player's motivation. The fact that the game has victory levels provides satisfaction and self-confidence in a way that allows for intense and passionate participation. All of this, coupled with the opportunity to solve problems, awakening creativity.

The last dimension is the possibility of multi contexts, aiming to adapt to different contexts and users, enabling greater integration between game and players. In this way, it simulates social groups allowing the evolution of some social skills. Representation and story tend to generate emotions and adrenaline because there are conflicts, competition, challenge and opposition.

5.2 Gamification in the Socialization Process

One of the reasons mentioned by Zichermann and Cunningham (2011) that motivate people to play is a way of socialization, considering that this issue is a critical point for the engagement of a multicultural team, as there are usually barriers that limit this interaction. These adversities are more easily faced when they are in an environment with low levels of stress and fun, allowing for an interaction that facilitates the acquisition of new knowledge.

Mark Prensky's (2001) list complements this relationship in two dimensions. The first refers to the possibility of improving interaction and interpersonal relationships among employees. Considering that gamification encourages interactions when simulating social groups, it becomes complementary to the existence of rules allowing all participants to know what they can and cannot do, creating a fun environment. The representation and story within the game, enables the connection between players based on emotions, strengthening creativity with a focus on collective decision-making. When these requirements are carried out together they tend to strengthen this virtual social environment providing intense and passionate participation.

The second dimension has a challenging character, enabling teamwork and strengthening social skills. The adaptability, goals, and interactivity of gamification promote the evolution applied in groups, enabling the creation of bonds between players, considering that the achievements are of the group and not the individual. The analysis of results and feedback linked to the various levels provide the concept of continuous improvement. The use of these characteristics together tends to smooth out cultural differences and channel energies towards solving challenges and, consequently, achieving goals.

6 Conclusion

Throughout this chapter, we observe the organizations' progress towards a global market and consequently the evolution of the personal department's functions towards a strategic character, becoming the human resources department. Due to increased competition and the search for new markets, organizations were forced to face the internationalization of their operations in order to achieve a competitive differential, or at least, compete on equal terms with their opponents.

We move towards the implication of a multicultural context, where technological advances and globalization have provided a growing increase in multicultural environments, with immigration and expatriation being examples of social movements of great importance for this purpose. It is in this context that there was a need to adapt the functions of the HRM to the IHRM, in view of the multicultural profile of the employees and the conflicts arising from this context. However, we concluded that it is necessary to manage the level of conflict to moderate, considering that the absence is discouraging and the excess hinders the performance of employees' functions.

And then we point to the strategic importance of employees to achieve organizational success, extracting their potential as much as possible without wearing them out physically and mentally.

We perceive through the concept of culture how this variable can interfere in social interactions and more specifically in the multicultural organizational context. However, cultural differences are one of the reasons for the creation of conflicts, which must be managed, a function that is also performed by IHRM.

We also analyzed the nine game' mechanics in gamification according to the model of Zichermann and Cunningham (2011), where they were described one by one to support our study. Although the game mechanics are not identical or even similar in all artifacts, we can conclude from the content presented that its issues, used individually or together, make it possible to achieve the stipulated objectives. Thus, the focus of gamification applied in organizations must be on the use of playful scenarios to develop, socialize, have fun and relieve stress, contributing to a better engagement of employees.

Training and socialization are processes aimed at developing knowledge and integrating employees with each other, increasing the likelihood of balancing the social relationships of employees and the organization's objectives. Therefore, the use of gamification in the training and socialization of multicultural human resources, if well used, tends to develop the potential of employees without taking them to physical and/or mental exhaustion, since this methodology can be fragmented into several tools and only one or more can be used at the same time, depending on the context. Furthermore, these features can adapt for intensity in different situations. For these reasons, we consider gamification to be a resilient tool.

More specifically, the high level of adaptation of gamification is what makes it an excellent tool for training human resources within multicultural organizational contexts, as there is the possibility of adapting to the players' profile and aligning their goals with the goals of the organization in a fun and challenging way. As well

as for socialization, considering that there is an incentive for social interaction in a more playful environment, which tends to reduce the cultural barriers of everyday socialization. For all the reasons discussed above, we conclude that gamification has a facilitating role for training and socialization to achieve their goals.

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Human Resource Management Practices in the Digital Era

Hafinas Halid, Siti Noorjannah Abd. Halim, and Kamalesh Ravesangar

Abstract Digitalization of Human Resource Management (HRM) is revolutionizing the way of HR practices in line with the current Industry 4.0. Back to the history of the HRM, traditional approaches are still relevant to be used; however, it is better to move a step forward by using the digital HR platform in order to be applicable in the marketplace. In order to be in the Digital HRM platform, the organization should be invested as well for the technology, manpower and the strong strategies. Throughout the HRM revolutions, in this current, critical pandemic will force either small or large organizations in tuning their traditional HRM to the digitalization HRM. For instance, the organization came out with strong stages of the HRM Digitalization transformation, re-structuring the organization process and the new perspective of HRM practices. This chapter discusses on how the traditional HRM tunes to the digitalization of HRM and what are the implications behind this transformation. Furthermore, the organization also must be well prepared to jump into this new industrial 4.0 revolution with the digitalization HRM in the workplace.

Keywords HRM · HRM practices · Digital era · Digitalization HRM

1 Introduction

In the current world, the whole society has undergone accelerated technological development, which contributes to the impact and changes towards the way an organization function. It puts pressure on organizations and people to adapt with the rapid changing world, which focuses on the number of digital innovations. Thus, the current period known as "digital era" or digitalization has become a world buzzword

H. Halid (✉) · S. N. Abd. Halim · K. Ravesangar
School of Business and Social Sciences, Albukhary International University, Alor Setar, Malaysia
e-mail: hafinas.halid@aiu.edu.my

S. N. Abd. Halim
e-mail: noorjannah.halim@aiu.edu.my

K. Ravesangar
e-mail: kamalesh.ravesangar@aiu.edu.my

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in the aspect of organizational press and emphasis as something that all organizations need to embrace in order to stay in this competitive world. As part of technology adaptation, transformation is required on all stages to develop a modern organization that has the courage for consistent improvement. So, digitalization has become a part of transformation which has been defined by Stolterman and Fors (2004) as a business model determined by *the changes related with the implementation of digital technology in all parts of human civilization.*

Some scholars even reveal that digital transformation or known as digitalization has altered the system of organizations operate critically that it becomes a vital element of corporate strategies (Heavin & Power, 2018), and also this digitalization approach in organizations has been affected around the world, which leads to modifications in consumer behaviour, expectations and value of products and services. In the perspective of changing consumer behaviour, organizations have to reconsider their business model to be accomplished in order to maintain competitive advantage. Furthermore, this digital era also impacts organizations' management fashion especially computers will be taken place all the manual work responsibilities, introduction to Artificial Intelligent (AI), which also become a substitute to non-repetitive intellectual tasks, "Big Data" has been implemented in many organizations, which referred to accessing to huge amount of information processes. The increase of digital tools linked to the Internet or also referred to as "Internet of Things" has also contributed to traceability of information. These are just a common example of how the digitalization world is impacting society but the similar debate made by most practitioners and scholars that digitalization saturated everything that can be digitized (Andersson, 2017). This is not only changing how we develop interaction with humans but also the digital transformation affecting the way an organization functions, which indirectly implies huge changes for any human resource manager.

In today's business world, the new challenges of digitalization have also brought changes in traditional human resource management (HRM) models. It has been seen through the advancement of new technologies, the method of human resources communicating with data and information has been altered. Many human resource functions such as employee recruitment and selection process, performance management and human resource planning have been intensely improved through the utilization of digital technologies, revising the services provided to its stakeholders. In fact, previous HRM focuses more on paper related work, which brings many disadvantages to the function of the HR Department as it involves time, cost and energy in any organization. In this regard, Palmer et al. (2017) highlighted an essential example of how digitalization has affected HRM based on the Adobe company case. In 2011, Adobe stopped trading licensed products in physical packages and transformed into a cloud-based software provider. This fundamental change of the company has resulted in new methods of working and introduced a new role for the human resource management (HRM) function. Thus, HR has become more people-oriented, creating a diverse workforce, and designing challenging tasks to keep the new generation of employees engaged in their work and organization. Moreover, HRM practitioners had to improve the way performance appraisal conducts, with immediate and continuous feedback given through new systems and workshops (Palmer et al., 2017; Smedley, 2014).

This condition shows how HR practitioners can be impacted by digitization as the management of human resources has to be transformed into new work adaptation to support new advancement of technologies in companies.

Furthermore, digitalization also changes the way employees interact in the organization, expectation towards their employer and career development, as well as the venue and duration of the work performed. In this aspect, the advancement of digitalization affects internal organizations based on many levels as it needs the adaptation and development of new knowledge and work methods. The workplaces also need to be emphasized the essential of investing towards the required skills development of employees especially if the improvement involves the introduction of new technology and roles. With regards of this, digital transformation is consistently changing how organizations recruit, choose, manage and support people. As a key part of the core mission of HR Managers, it is important for the employers to attract, support and develop their employees aligned with the overall organizational strategy. Digital approaches to human resource management are critically express the important role and become part of defining strategies for human resources and the whole organization as well.

2 What is Digitalization?

We are gradually evolving into a civilization that is heavily reliant on technology. Digitalization is affecting every industry. It doesn't matter if you're in the agriculture, education or business ecosystems but the impact of digitalization on every business sector can be seen to be progressing well. Digitalization is becoming increasingly important in growing corporate ecosystems. Adapting to technology has proven to be a positive aspect in the business aspects. It simplifies work methods so that individuals can focus entirely on the task at hand and are less distracted by external elements that existed previously. Digital technologies have infiltrated every part of our life, drastically altering how we seek and receive information. For example, rather than using yellow pages directories or other offline media, we now use search engines to find items and services. Chats, email, blogs and social media posts are all ways we share our experiences with others. In other words, digitalization and digitized data enhance the media we use, the content we consume and exchange, and the customers we interact with.

The term "Digitalization" was originally revealed by Robert Wachal in 1971with the introduction of "Digitalization of Society" and described its origin due to extensive use of technologies. There are many authors who come up with various definitions. Kagermann (2015) stated that digitalization known as networking created for people and things and also merging between real and virtual worlds that are allowed by Information and Communication Technology (ICT). ICT in the perspective of HRM roles is named differently such as web-based human resources, human resource information system (HRIS), virtual human resource management. Human resources intranet, computer based HRM systems and HR portals. However, the term e-HRM is

the most commonly used. Based on the e-HRM term itself, its basis has been related to the 1990s idea of the development of e-commerce (Lengnick-Hall & Moritz, 2003). It is crucial to understand the difference between "digitization" and "digitalization." Digitization refers to the transition from analogue to digital (Gartner Inc, 2018a), while digitalization refers to using digital technology to improve existing business models, generate new revenue and create value-adding opportunities (Gartner Inc., 2018b).

The impact of digitization on the business environment is raising insecurities among executives around the world (Unruh & Kiron, 2017). Digitalization has changed the way people do business in a variety of industries. In retail, for instance, corporations such as Amazon and Alibaba have inflicted chaos on shopping malls and traditional trade. Unruh and Kiron (2017) revealed that the impact of digitization in retail will spread to other industries such as energy, hotels, transportation and manufacturing in the near future. Organizations are developing plans to cope with the issues and ramifications of digitalization in order to be prepared to deal with it. In order to have a better digital future, companies should play a huge role to implement digital technology. Considerations have to be taken on the risks and chances reflected by digital technology. Below is the framework (Fig. 1) developed by Unruh and Kiron (2017) for better reflection of digitalization.

Digitalization is the initial stage that refers to the transfer of products and services to a digital format, as well as the inventions that arise as a result of this conversion. For tangible assets and products, this conversion takes longer. The second stage is connected to the first since it makes use of the digitalized products generated in the first phase, but it also develops new business models and processes. The third stage is new digital models and processes to restructure economies, which have happened due to digital transformation. As a result, technology is combined by people in their life. Ross (2017) stated about digital transformation, which has been expressed that if companies fail to distinguish between digital, digitization and digital transformation, they may make costly mistakes. Organizations need to transform if digital discusses issues such as technology, cloud, internet of things, mobile, accessibility, and how businesses could shift to take advantage of these technologies' benefits. Digitization,

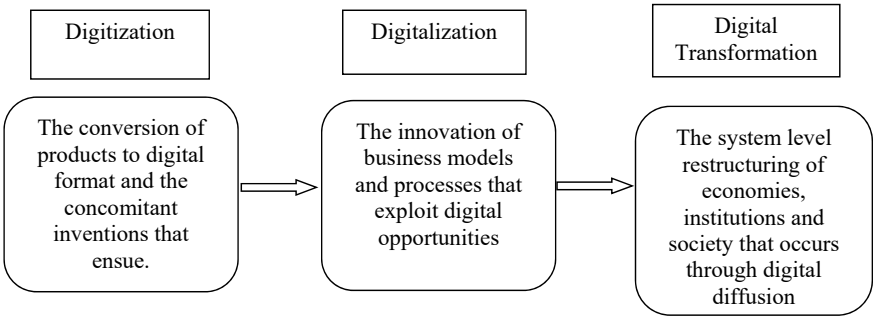

Fig. 1 Digitalization framework. *Source* Unruh and Kiron (2017)

on the other hand, makes it easier for an organization to go digital. While digital transformation strives to rethink the value proposition of a firm.

E-HRM has been stated by many scholars as any kind of HR activities either administrative or transformational which should be supported by information technology. However, E-HRM is known as a web-based technology solution to provide online and real-time HRM solutions through the utilization of current information and communication technology. According to Strohmeier (2007), E-HRM is defined as planning, execution and application of information technology for both networking and supporting of at least two individual or shared actors in their collaboration of performing HR activities. Besides that, E-HRM is also used as "Virtual HR" to comprehend a network-based structure developed based on collaboration and facilitated by information technologies to assist the organization obtain, progress and organize intellectual capital (Lepak & Snell, 1998). Moreover, e-HRM also has been viewed as a method of implementing HR strategies, procedures and practices in organizations through sensible and direct support of full web technology-based channels utilization. In fact, e-HRM includes all possible mechanisms and communications between HRM and IT through developing value for managers and employees in the organization, as well as outside entities.

A strategic HR function connects HRM activity to the strategic management process and business objectives. This brings to an integration set of policies and practices created to perform the organization's implicit or explicit business strategy in order to manage the human capital of a firm. HR management digitalization focuses on integrating all aspects of personnel management with the competencies of quickly evolving digital technologies for transparency, reliability of orientation and measurement of human capital management processes, which is most likely as other company assets management (Fedorova et al., 2017; Kokovikhin, 2017). This has been revealed that in the twenty-first century, HR managed to transform the employees' experience through alteration of HR processes with the utilization of new digital methods, applications and platforms of providing HR services, also digital communication.

3 Process of Digitalization

It becomes apparent that digital transformation can be seen in the HR function that brings the challenges of developing new concepts and values and spreading it through organization. Thus, every HR process of revolution has its own aim, which is to influence the cultural modification and with introducing consistent values to bring the effects towards process adoption. The position of HRM particularly in the digital transformation process is to manage changes in the workforce by converting to new business strategy and empower employees with digital approach while striving towards digitalize it and accountable for its own transformation.

There are few questions to be asked before the implementation of digitalization process:

(a) Do you still haven't implemented digital workflows in your company?
(b) Do you still use the phone, fax and mail to communicate?
(c) Are you still doing your internal planning on a drawing board?
(d) Would you wish to provide tablets to your employees or automate your weekly shop floor?

Every organization, from manufacturing to logistics and energy, is undergoing a digital transition. Every business faces new obstacles as a result of new technologies. Meanwhile, relationships with customers and suppliers are also evolving.

3.1 Three Main Pillars of the Digitalization Process

The digitalization strategy is the foundation of the Industrial Revolution 4.0 especially during this current world situation. Most organizations are switching from the traditional Human Resource Management (HRM) to the HRM Digitalization due to the advance catch up with other competitors in their industry. For instance, each organization has their own digitalization strategy to be competitive among them. Hence, there are approaches that take into consideration three main pillars of the digitalization process, which are **setting goals and doing a strategies analysis, operationalizing the digitalization strategy and putting the digitization strategy into action.**

3.1.1 Setting Goals and Doing a Strategic Analysis

To begin, management should work together to develop a digital vision and agenda. This includes investigating new technology and digital development trends to see how they can benefit the business. Digital development patterns show how to use digitalization to promote company strategies. They can range from using digital data to make real-time forecasts to branching out into entirely new industries. This step also involves a company to investigate that takes into account the industry and competitors. Then, depending on their own business and IT strategy, firms should define a target vision of the digital business model and prioritize digital concerns. The key component of this is determining the level of digital maturity.

Digital maturity demonstrates how far a company has progressed in dealing with the topic of digitalization and the areas where it may need to improve, as measured by the most recent technology. To this purpose, companies need to bring together IT and officials from several departments inside a firm. Then they need to look at various elements to determine their digital maturity level. These considerations apply to IT design, automation and process optimization across the board, including customer and supplier connections.

The results are divided into five categories, with scores ranging from "non-digital" to "digital leader." After determining a company's level of digital maturity, it can

develop goals based on that information. First and foremost, the prospects and goals should be a suitable fit for the company's future business strategy. As a result, becoming a digital leader in every field is not the primary priority.

3.1.2 Operationalizing the Digitalization Strategy

After a company has defined its digital vision, management needs to set an agenda and assess its digital maturity through moving on to identifying the know-how and skills which will be required, as well as using the information to identify innovations, such as new services. It is critical to bring together IT, expert departments and middle management to address the demands of all of a company's divisions and departments.

3.1.3 Putting the Digitization Strategy into Action

The final phase is to put the strategy that has been devised into action based on this knowledge. The business may now create its own digital plan and portfolio, as well as establish priorities. This stage of the process entails communicating with top management to align individual digital projects with the company's overall growth. The organization will be in the midst of digital transformation once this step is accomplished. In order to develop a linked platform and new industry revenue sources, CEOs and boards of directors have made digital transformation a key priority. Executives must approach strategy with an understanding of the distinctions between transformation and business optimization. Digital transformation typically requires calibration and continuous learning across a mid- to long-term planning horizon. Gartner's Strategic Planning Framework includes three planning horizons that determine the three steps to full transformation.

(a) **Define strategy**

The first stage is to think about the big picture goals and initiatives that drive your company, and how you can improve them with technology and information design patterns.

(b) **Create strategic plans**

Once you've figured out how to use information and technology to help your company reach its long-term objectives, start putting together a strategy plan to help you get there.

(c) **Implement with operational plans**

This element deals with the implementation of specific projects and adjustments, as well as other operational responsibilities, which are not covered by the strategic plan, such as regular software upgrades or hardware maintenance. The company needs to initiate, revise or refresh strategic plans in response to changing business conditions or directions (Fig. 2).

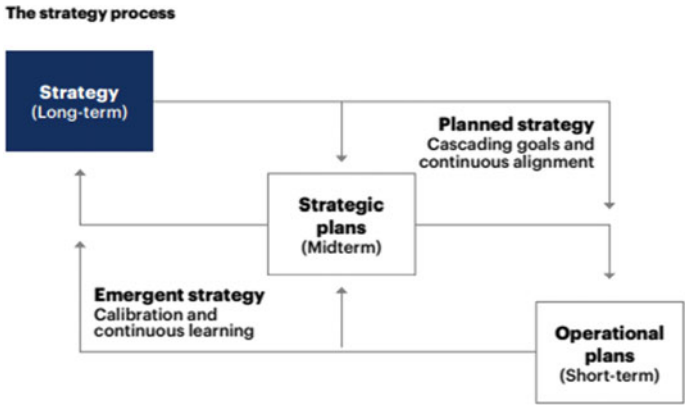

Fig. 2 Gartner's strategic planning framework. *Source* Gartner (2021)

4 Stages of Digital Transformation

Digital transformation is known as the integration of digital technology into all elements of a business, radically changing how you operate and provide value to clients. It is also a cultural shift that necessitates firms constantly challenging the status quo, experimenting and learning to accept failure. When it comes to digital change, it is difficult to keep up with the pace of change in the business world but companies that embrace a culture of change and transformation are well on their way to securing their company's future. There are various stages that an organization goes through on its path to digital transformation, as well as what it takes to achieve actual change. Steam power was the disruptive technology that revolutionized the globe during the first of the four Industrial Revolutions meanwhile the assembly line was in the second, and the computer was in the third. We are currently living in the fourth Industrial Revolution, which is digital. Intelligent digital technologies such as artificial intelligence (AI) and machine learning, Internet of Things (IoT) networks, advanced analytics, and robotics have the potential to revolutionise how we work and do business—as well as how businesses interact with their customers and the rest of the world.

Digital transformation is about the people and mindset of the technology savvy, which can empower the stakeholders of the organization. This approach has been used in the organization since the online platform has become rampant and widely used. Hence, there are some steps of digital transformation strategy that should be followed in order to get a better impact of this digital platform. There are three stages of the digital transformation strategy; digitalize the manual process, integrate intelligent technologies and manage cultural change.

4.1 Digitalize the Manual Processes

Intelligent technology must be integrated into existing business processes in order for digitalization to take place. The first step is to convert analogue documents and assets to digital data. Then search for methods to make the procedures more efficient. For instance, gateway devices and sensors are required to link current devices and machines into an IoT network. Other technology, including virtual reality (VR) wearables, can be used to help humans with tasks like customer service and inventory management. Part of this process is ensuring that the organization's Enterprise Resource Planning (ERP) and planning systems are adequate to the task at hand. The greatest ERP solutions are AI and machine learning-powered, which run on fast and scalable in-memory databases by making the next step seem aligned.

4.2 Integrate Intelligent Technologies

Technologies such as AI, machine learning and advanced analytics power made possible usage of data analysis, real-time automation and complicated learning algorithms. It is not just about the technology, however, businesses must have upskilled and reskilling initiatives in place to ensure that their staff can make the most of these intelligent technologies and add the most value to their jobs and workflows, so that it can be a way to use the insights and capabilities.

4.3 Manage Cultural Change

According to a recent Harvard Business Review survey, cultural problems are the largest hindrance to digital transformation which shows 63% of executives. The most successful transitions occur when companies accept that change is difficult. People who have been doing things and understanding things in a specific manner for a long time (perhaps decades) will want assistance in not only seeing the potential benefits of these changes but also in adapting their workflows and habits to make the most of them.

5 Human Resource Management (HRM) Evolution

Human Resource Management evolution across time is vital for understanding the philosophy, functions and practises of HRM that are used in various settings so that appropriate HRM practises can be evolved in the current situation. The HRM acts as part of management discipline, which has followed the pattern of management

Table 1 Industrial revolution era

Revolution stages	Year
Industrial revolution era	Nineteenth century
Trade union movement era	Close to the nineteenth century
Social responsibility era	Beginning of the twentieth century
Scientific management era	1900–1920s
Human relations era	1930s–1950s
Behavioural science era	1950s–1960s
Systems and contingency approach era	1960 onwards
Human resource management era	1980 onwards

development due to the connection of the difficulties in both domains. It is a relatively new word used to describe how an organization manages its human resources and still growing into a combination of organizational behaviour, personnel management, labour relations and labour law. Becker and Huselid (1998) state that the most substantial value is generated in the Human Resource function by focusing primarily on the delivery of professional and often research-based HR activities such as staffing, development, remuneration, labour relations, and so on. These procedures are crucial, and research shows that substantial value to the firm can be seen if carried out properly. Various stages in the development of human resource management practices can be classified based on the industrial revolution era to the present era as below (Table 1).

The beginning of that era can be seen in the classification of several stages of human resource management in terms of period. In each period, a different technique to managing people at work has been emphasized. A new period does not necessarily signal the end of the previous one, but there has been some overlap. The following are the main characteristics of these eras, as well as the types of practices linked to human resource management.

5.1 Industrial Revolution Era

The systematic development of HRM began with the industrial revolution in Western Europe and the United States in the 1850s. The Industrial Revolution reflected on the development of machinery, the application of mechanical energy in production processes and, as a result, the birth of the notion of a factory with a large number of workers working together. The old cottage system was changed by the industrial system. The Industrial Revolution introduced numerous changes, including consolidated workplaces with big groups of employees, mechanised production processes, employees migrating away from their homes and indirect communication between

factory owners and employees. Three HRM methods were established to manage people in the manufacturing system of the industrial revolution: recruiting, training and control.

5.2 Trade Union Movement Era

Shortly after the factory system was established, employees began to organize themselves based on their common interests to form workers' associations, which became known as trade unions. The primary goals of these organizations were to protect their members' interests and to solve their problems, which arose primarily as a result of the use of child labour, long hours of work, and poor working conditions. Other aspects of work, such as economic problems and wages, employee benefits and services, and so on, became issues later on. These trade unions began using weapons such as strikes, slowdowns, walkouts, boycotts, and so on in order to accept their demands. These trade union activities compelled owners and managers to implement employee grievance systems, arbitration as a means of resolving disputes between owners/managers and workers, disciplinary practises, expansion of employee benefit programmes, holiday and vacation time, clear definition of job duties, job rights through seniority and the implementation of rational and defensible wage stipulations.

5.3 Social Responsibility Era

Some factory owners began to take a more humanistic and paternalistic approach to employees in the first decade of the twentieth century. The paternalistic approach to labour management is based on the philosophy that labour is similar to a child, and the owner is similar to a father, and the owner should care for his labour as a father care for his children. Those industrialists who took a paternalistic approach provided several concessions and benefits to the labour force, such as reduced work hours, improved workplace facilities, model villages for employees and so on. All these practises contributed to the advancement of the social welfare aspect of labour management. Many critics of the paternalistic approach argued that it was used to address problems caused by the labour union movement, as there were numerous trade unions that frequently disrupted work performance. Employers noticed that workers were becoming uncontrollable, so they implemented a welfare scheme to address the issue. As a result, this was more of a compulsion than a philosophy.

5.4 Scientific Management Era

Taylor began to investigate the "one best way of doing things" around the twentieth century. He was able to significantly increase employee productivity using his experiments, and he wrote many papers and a book on scientific management based on these experiments. The main principles of scientific management are:

(a) Science replacing rule of thumb.
(b) Harmony over conflict.
(c) Cooperation over individualism.
(d) Development of each individual.

Scientific management techniques that related to worker management consisted of functional foremanship, standardization and simplification of work and a differential piece wage system.

5.5 Human Relations Era

Around the 1920s, management researchers focused on the human factor at work and the variables that influence people's behaviour. Hugo Munsterberg had previously written a book titled "Psychology and Industrial Efficiency," which advocated for the use of psychology in the areas of personnel testing, interviewing, attitude measurement, learning, and so on. This brief period was known as the "Industrial Psychology Era." In 1924, a group of professors from Harvard Business School in the United States began an investigation into the human aspects of work and working conditions at Western Electric Company's Hawthorne plant in Chicago. They came to the conclusion that, in order to improve productivity, management should focus on human relations as well as physical workplace conditions. As a result, concepts such as social system, informal organization, group influence and non-logical behaviour entered the field of personnel management.

5.6 Behavioural Science Era

In contrast to human relations, which assume that happy workers are productive employees, behavioural scientists have been goal-oriented and consider understanding of human behaviour to be the primary means to that end. They have used a variety of sophisticated research methods to better understand the nature of work and the people who work in it. The following are the major conclusions drawn from behaviouralists' contributions:

(a) People do not dislike their jobs. They will achieve their goals if they have been assisted in setting them. In fact, the job itself is a source of motivation and fulfilment for employees.
(b) Most people can exercise greater self-direction and self-control, as well as generating more creativity than is required in their current job. As a result, their untapped potential remains untapped.
(c) Managers' primary responsibility is to maximize the organization's untapped human potential.
(d) Managers should foster a healthy environment in which all employees can contribute to the best of their abilities. The working environment should be healthy, safe, comfortable and convenient.
(e) Managers should allow their subordinates to direct their own work and encourage them to participate fully in all important decisions.
(f) Subordinate influence, self-direction and self-control can all be increased to improve operational efficiency.

5.7 Systems and Contingency Approach Era

In the current era, the systems and contingency approach have sparked the interest of management thinkers. It is an integrated approach based on empirical data that considers human resource management in its whole. The basic idea behind this approach is that any object must be analyzed using a method that involves simultaneous variations of mutually dependent variables. This occurs when a system approach is used to manage human resources.

5.8 Human Resource Management Era

When the factory system was implemented in production, many employees began to collaborate. It was felt that someone should be in charge of recruiting, developing and overseeing the welfare of these employees. In most large organizations, an industrial relation department was established for this purpose, which was primarily concerned with workers. However, as time passed and the complexity of managing human resources in large business organizations grew, the scope of the industrial relations department was expanded to include supervisory and, later, managerial personnel. The department of industrial relations was renamed as the personnel department. People were treated as socio-psychological beings rather than physiological beings due to increased competition for market share, competition for resources including human talents, and increased knowledge in the field of managing human resources and large organizations changed the name of their personnel department to human resource management.

6 Traditional Human Resource Management (HRM)

Human Resource Management has been ordinarily used for about the last 15 years known as "personnel administration". This concern is based on the technical aspects of industrial welfare, recruitment and selection, acquisition of other personnel activities, industrial relations, and legislation. An organization's Human Resource Management focuses on the practices that could help the organization to deal with an effective management process. However, the HRM has changed from time to time and become better onwards. Thus, every large or small organization employs a variety of capital to run its operations such as cash, valuables or goods used to generate income for a business. For instance, a retail store uses registers and inventory, whereas a consulting firm may have proprietary software or buildings. Whatever industry they are in, all businesses have one thing in common: they need employees to make their capital work for them.

Human resource management (HRM) is the process of hiring, training, compensating, developing policies and devising retention strategies. The HRM field has evolved significantly over the last two decades, making it an even more important role in today's organizations. HRM used to focus on processing payroll, sending birthday gifts to employees, organising company outings and ensuring forms were correctly filled out—in other words, more of an administrative role than a strategic role critical to the organization's success.

When the term "human resource management" first became popular, it was criticised for referring to people as resources, as if they were any other factor of production to be leveraged into economic value. Besides that, Boxall and Purcell (2016), see this as a misunderstanding of the term. They argue that "human resources" are not people, but rather their knowledge, skills, and energies that they use in their daily roles: employees are not human resources. Somehow employees are autonomous agents who hold human resources, which are the skills they can use and develop at work and which they take with them when they leave the organization.

The traditional Human Resource Management practices focus on the functional activities, which are more on solving employee problems, managing labour relations and keeping their employees feel ease and happy. In addition, the traditional approach does not educate employees about responsibilities or how their work will be done but the HR manager will be considered on this matter. Hence, in this traditional HRM, some practices would apply in the organization such as staffing, induction, training and development, compensation, employee welfare, organizational policies, performance appraisal and health and safety.

6.1 Staffing

Staffing is primarily concerned with the recruitment and selection of human resources (people). Prior to hiring, human resource planning and recruiting are carried out.

Recruiting is the personnel function of identifying and hiring the most qualified candidates to fill job openings. The selection function chooses the most qualified candidates based on the recruiting function to attract people to the organization. During the selection process, human resource personnel assist managers in deciding which applicants to choose for the available jobs and which to reject.

6.2 Induction

Induction is used to introduce a new employee to his or her new job and the employer. It allows new employees to become acquainted with more intimate aspects of their job, such as pay and benefits, working hours, and company policies and expectations.

6.3 Training and Development

Employees are given the skills and knowledge they need to do their jobs well through training and development. It must be made available to all employees. Organizations frequently provide training for experienced employees in addition to new or inexperienced employees. This could be because their jobs are changing, or the company requires them to work more efficiently. Employees are also prepared for higher-level responsibilities through development programmes. Training and development programmes ensure that employees can handle the stresses of their jobs while still performing well.

6.4 Compensation

The HR department uses an assessment system to determine how much employees should be paid for specific jobs. Compensation is expensive for businesses, so it requires careful consideration during the human resource planning stage. Compensation has an impact on staffing because people prefer to work for a company that offers a higher wage in exchange for the work they do. It serves as an important motivator for employees to do more in their jobs and advance to higher levels. As a result, it is linked to employee development.

6.5 Employee Welfare

In 1878, legislation was passed to establish a 60-h work week for children and women. During this time, trade unions began to emerge. The first trade union conference

was held in 1868. This marked the beginning of collective bargaining. The Welfare Workers Association was renamed the Chartered Institute of Personnel and Development after its formation. According to Arthur James Todd, "employee welfare" refers to "anything done for the comfort and improvement, intellectual or social, of the employees, which is beyond the wages paid that is not a necessity of the industry". Employees are satisfied and committed to the organization if they are provided with such services. Though welfare services are merely maintenance factors and not motivators, they are necessary for the improvement of the organization because they are closely related to employee productivity.

6.6 Company Policies

Every organization has policies in place to ensure fairness and continuity. One of HRM's responsibilities is to create the language that will accompany these policies. Policy development process included HRM, management and executives. For example, an HRM professional may recognize the need for a policy or a policy change, solicit input on the policy, write the policy and then communicate the policy to employees. It is critical to note that HR departments do not and cannot work in isolation. Everything they do must involve all of the organization's departments.

6.7 Performance Appraisal

The HR department of any organization will evaluate the performance of its employees. This Human Resource Management function assists the organization in determining whether the employee they have hired is progressing toward the organization's goals and objectives. On the other hand, it also assists the company in determining whether the employees need to improve in other areas. It also assists the HR team in developing specific development plans for employees who have not met the job's minimum requirements.

6.8 Health and Safety

Human resources are critical in the development and implementation of occupational health and safety policies. Workplace health and safety encompasses a wide range of duties and initiatives aimed at providing employees with a safe working environment. It is widely accepted that a happy workforce is more likely to be a productive workforce. Coordination between HR and safety and health results in company policies being applied and followed more consistently, resulting in greater satisfaction of employees working at the site.

6.9 Industrial Relations

Management and labour consultations became more common during the war. This meant that HR departments were in charge of organising and administering it. The emphasis shifted to health and safety, as well as the need for specialists. The need for specialists to deal with industrial relations was recognised, so the personnel manager became the organization's spokesman when discussions with trade unions/shop stewards were held. Industrial relations were very important in the 1970s. The tense atmosphere during this time period emphasized the importance of a specialised role in labour-management negotiations. The HR manager had the authority to negotiate pay and other collective bargaining agreements.

7 Transition Process from Traditional to Digital HRM

Digital transformation has transformed how businesses interact with their customers, how they run their operations, how they envision their business model, and how they organise themselves (Westerman & Bonnet, 2015). It is about integrating digital technologies such as social, mobile, analytics and cloud to transform how businesses operate (Kane et al., 2015). The incorporation of digital technology into business processes has become critical for modern organizations' survival and competitive advantage (Bharadwaj, 2000). Palmer et al. (2017) assert that human resource management in the digital age is more varied, more people-oriented, and has the responsibility of designing diverse, challenging jobs to keep young employees more engaged in their work. The traditional ways in which HR functions are carried out in organizations are called into question by digital transformation.

A smooth transition from traditional to online HR necessitates an understanding of each organization's unique requirements. It is critical to develop a digital platform that not only addresses the broad issues that businesses face—such as employee absence, engagement and retention—but is also adaptable enough to grow with the company. This may entail "picking and mixing" HR programmes to achieve the right balance, especially in smaller organizations. Essentially, we are in an experimental era in HR, with innovation playing a critical role. It's easy to think of traditional and long-established systems as inherent in corporate structures but bringing the HR function online reflects the larger world of work—a shift in mindset and practical application that provides greater speed, agility, and flexibility to businesses across the board. Below is the transition of HR over time and how it has become possible for it to take on a more mature role.

7.1 The Fourth Industrial Revolution Has Begun

Professor Klaus Schwab defined the fourth industrial revolution as the fusion of the physical, biological and digital worlds, altering the way we live, work and interact with one another. The evolution of new technologies has an impact on all disciplines, including human resources. The fourth industrial revolution necessitates a significant amount of upskilling. In an age defined by artificial intelligence and data, there are not enough skilled workers to make sense of it all. Even HR professionals must think and act like data scientists, which is central to HR's digital transformation. While HR is expected to take responsibility for their own reskilling and upskilling, they are also expected to take charge of their organization's employees' learning needs.

7.2 HR Shifting to the Cloud

When the cloud arrives, HR's transition from manual processes to a centralized data centre is complete. Cloud computing in human resources simplifies recruitment, enables innovation, improves employee well-being by bridging communication gaps, and allows for a more global approach to human resources. This gives HR a more strategic role in the organization and earns it a seat at the table with the C-suite and transforms it into a business partner with the authority to contribute to key business decisions.

7.3 All Decisions Are Being Driven by Data

As the cloud centralizes all information and data, HR begins to derive insights from it. HR now uses these insights to recruit the ideal candidate, predict which employee has the potential to be a key leader in the organization, and which employee is at risk of leaving the organization by processing data using analytics, machine learning and artificial intelligence. "In the future workplace, products that can organize data in meaningful ways will be the norm," stated by Laura Butler, SVP People and Culture at Workfront. "Companies will need skilled data analysts and strategists who can help managers interpret data for better decision making." Though all HR professionals must now think like data scientists, a specific role is required to analyse, interpret and enable decision-making using data analytics. Data is the backbone of HR's digital transformation journey, and it will define the future workplace.

8 Digital Human Resource Management Transformation Stages

Human Resource Management (HRM) has become an important department in an organization in terms of recruitment and solution, training and development, performance appraisal, reward and recognition and others. According to Solis (2018), there are Six-Stage Models of digital transformation that can be applied to this HRM Digitalization in organization. This model is applicable to all initial transformation in organization, and it gradually discovered the complexity of the changes. The Six-Stage Model covered.

8.1 Business as Usual

The Human Resource Management (HRM) Digitalization is the transformation from the traditional HRM. According to Ahmed and Ogalo (2019), traditional HRM includes the recruitment and selection, induction, reward and recognition, performance appraisal, training and development and counselling which is conducted by using manually instead of digital platforms. Due to that, if the organization tunes the traditional HRM to digital HRM, the HR manager still must run the process as usual but in a different approach. This digital platform gives more benefit to the organization especially in productivity of the HRM process. Markedly, HR managers should spread the planning to all staff in the organization to ensure that all of them are ready for these changes (Cafferkey et al., 2019). To clarify, when the HR process transforms to digitalization method means that all staff also have to apply it in daily tasks such as online report duty, online leave application and online performance appraisal key. Hence, even though there is a transformation of the HRM process in the organization, the business is still running as usual.

8.2 Present and Active

When an organization decides to move from the traditional HRM phase to the digitalization method, the HR manager needs to do some research on that to ensure the transformation is worth it. According to Jin (2021), it is not easy to move from traditional to digital phase because it incurred financial and non-financial capital. The pre and post of the digital transformation should be conducted internally and the organization can have a look on the patterns of the transformation in detail (Marler & Parry, 2016). Furthermore, once the organization tunes to the digital HRM, the HRM department must be always present and active instead of just being as before. Significantly, the transformation supposedly brings an effective and efficient workflow in the organization compared to previous traditional ways. Thus, when the organization

decides to change to HRM Digitalization, it must be present and active instead of normal routine like before.

8.3 Formalized

The formalized refers to something official or decides to organize it according to a fixed structure. This happened when the organization agreed to change from traditional HRM to HRM Digitalization approach. When the top management has decided to accept the HRM digital platform in the organization, it should be formally announced to all the staff (Marler & Parry, 2016).

8.4 Strategic

Strategic management is an ongoing process in which organizations apply to analyze internal and external processes and resources. After the organization formally decides to change to a digital platform, it means that the HR manager should analyze both internal and external potential of applying this digital method (Marler & Parry, 2016). Markedly, the HR manager has to look at the strength, weakness, opportunity and threat for the organization to ensure that when the HRM Digitalization is applied, it can be effective to all staff internally. According to Ruel and Bondarouk (2014), the implementation is the execution of the necessary strategies to meet the objectives that have been set. In addition, it is to ensure success and bring the organization to the next better level onwards. Hence, strategy is a must because it is an appropriate step measure that provides necessary feedback with facts and strong justification.

8.5 Converged

The digital platform becomes a key priority across the business path especially for the large organization in order to make sure the organization still has competitive advantages in their industry (Ruël & Bondarouk, 2014). A formal transformation team is set up, and this digital platform is being driven across all entities. The HRM Digitalization would give the employees a new experience to the forefront. The HR manager will arrange everything, and it can be useful to the organization specially to ensure the HR process smoothly as well.

8.6 Innovative and Adaptive

The digital HRM is now a strength of organization because every process in HR must use this digital platform. The success of the Digitalization HRM affects the continuous improvement in a business. The development of different scenarios in the HRM process brings an innovative and adaptive environment and for future best management practices. According to Khashman and Al-Ryalat (2015), the HRM Digitalization prepared the staff on practices in a new environment and climate, new knowledge and skills and required an effort on that. Thus, in the way to make the organization compatible with industry by facilitating the HRM Digitalization as the trending platform in business operations.

9 Digital Human Resource Management (HRM)

In recent years, there has been an increase in the use of technology in Human Resource Management (HRM) practices across all types of organization to gain strategic advantages and achieve high performance (Van Den Heuvel & Bondarouk, 2016). Globalization business trends, online business, mobility, competitive market, high business speeds require organizations to transform from traditional to digital operations. In addition, organizations are entering a competitive market, ensuring high productivity, innovation, adaptability and flexibility. The fundamentals of this evolution lead to changes in HRM practices. The forthcoming digital revolution requires a modification of the business practices).

HRM is an essential function for every organization and business cannot function well without employees. Industry 4.0 has transformed the roles, responsibilities, skills and qualification requirements of employees in the workplace as business activities become increasingly digitized (Hecklau et al., 2016). Digitalization has an impact on all areas of employment such as manufacturing, marketing, finance, supply chain and Information and Communication Technologies (ICT). Changes in employee roles, responsibilities and skills requirements will lead to the changes in HRM practices including recruitment and selection, training and development, performance management and relocation of employees. Furthermore, industry 4.0 also creates challenges to HRM in regard to lack of skills and qualifications required and loss of jobs to automation, robotics and information technology applications (Sung, 2018).

Digitalization requires the adaptation and creation of new knowledge and operational procedures as well as introduction of new digital technologies that require changes in business models and alignment between the processes, practices and organizational culture. According to Bondarouk and Ruël (2009), digital technologies are designed for constantly changing methods practised by an organization of hiring, managing and supporting people. Besides that, the use of digital technology

will increase the productivity of the employees of the organization, increase the efficiency of the employee management system and the increasing competitiveness of the organization in a more sustainable position in the market. All in all, digital and automation are no longer new for organizations around the world and most of them are ready to invest in it further.

Digital transformation has made its way beyond the IT department across industries, sectors and geographies. The digital era is advancing at rapid speed that is fundamentally altering the way organizations function and requires the development of new ways of thinking about service delivery that influence the way business operates. Shah et al. (2017) also highlighted how digitalization of HRM processes enables to remove many routine tasks, to reduce the risk of human error and empower experts to solve important issues, enabling them to use their knowledge and skills more effectively in solving business problems. As a result, the HR departments are having a significant impact on their functions and their involvement in finding innovative methods to manage employees. Thus, the significant impact on the functions and roles of the HR departments in identifying innovative methods to manage people and execute daily operations. Generally, HRM functions or practices consist of development of HR strategies and policies, HR planning, recruitment and selection, training and development, rewards and recognition, management of employee information, retention and retirement. To ensure the effectiveness of execution of HRM practices, organizations have to go digitalize and transform all the practices in accordance with how business operations are carried out.

Ketolainen (2018) defines digital HR as "*the change process of moving to a digital HR to become automated and data-driven. It is the use of technologies that enables changing business*." In digital HRM, social, mobile, analytics and cloud (SMAC) technologies are utilized to optimize processes and make human resources (HR) more effective, efficient and linked. In addition, many scholars stressed that execution of digital HRM is important for an organization to improve their performance and maintain relevance in the digital era. Therefore, to remain competitive, organizations must be prepared to accept the adoption of new technology. In this situation, digitization is viewed as a need, an unavoidable transformation from which no organization can escape. In this situation, digitization is seen as an imperative, and this transformation is inevitable by any organizations.

9.1 Purpose of Digital HRM

Digital HRM is a solution for an organization and its business performance. To keep up with digital trends, organizations need to innovate the main HR functions, including recruitment and selection, training and development, performance management, compensation and reward and career management. It is seen that most of the digital HRM activities are carried to the web and mobile applications to provide effective and productive HR practices for the employees and provide valuable information for the organization. Besides that, by using embedded technology in HRM

activities, indirectly reducing the stationery, saving time and reducing costs. In this case, it is in line with the sustainable development goal, which aims to achieve a better and more sustainable future for all people and the world by 2030. The purpose of digital HRM for organization is as follows:

(a) Enhancing the quality of HRM-related services/functions.
(b) Providing organizations with effective and efficient HR practices.
(c) Providing the appropriate environment for employees to create and implement strategic HR practices.
(d) Creating a conducive atmosphere for employee developing and implementing strategic HR practices.
(e) Providing an appropriate career planning approach and development opportunities.
(f) Designing training programs for employees based on their job descriptions and skill needs.
(g) Reduce administrative procedures and operational cost.
(h) Reduce the number of employees and HR department staff.
(i) Using technology platforms such as e-mails or other social media by sending appreciation messages to motivate employees. Recognition through digital platforms will improve the employee-employer relationship within the organization.
(j) Increasing the quality of communication and disseminating the information within the organization. Increase in the possibility of producing and implementing new ideas. Employees share their ideas and suggestions with their colleagues in the organization.
(k) Establishing a flexible working environment that adapts to global challenges and changing workforce requirements to manage across geographical areas by using the same system universally. Organizations able to create solutions for problems across geographies and time zones, without interfering with the organization's regular work operations.

9.2 Digital Human Resources Management (HRM) Practices

All potential integration methods and contents between HRM and information technology aimed at generating value inside and across organizations will be explored in depth under the umbrella term of Digital HRM. Digital technologies are actively used by organizations around the world for HR functions. In the past century, HRM has changed dramatically. It has transferred from operational practices towards a more strategic and digitalization process. Application of ICTs in HRM functions is a prerequisite for any organization to successfully adopt and implement Fourth Industrial Revolution (Industry 4.0) (Evseeva et al., 2019). Nowadays, most of the organization functions and activities are transformed into automation.

Digital HRM is commonly discussed by academicians and HR practitioners as a widespread management topic worldwide. Digitalization of HRM can accelerate the HR process such as e-recruitment (online application for internal and external recruitment), online training and development (webinar and virtual learning) online selection process (easier for the interviewees to attend the interview session especially during pandemic Covid-19), reward and recognition and performance appraisal as well. When the digital platform is applied in the organization, the HR process becomes more efficient and fast responses intra-organization (Ruël & Bondarouk, 2014). This section discussed seven important HRM practices that have been digitized; human resource (HR) analytics, recruitment and selection, training and development, performance appraisal, compensation and benefit.

9.2.1 Human Resource (HR) Analytics

A proper digital HRM practice organization needs to gather all data and information related to human resources. According to Heuvel and Bondarouk (2016), HR analytics is the systematic identification and measurement of the human factors that influence business results. Marler and Boudreau (2017) defined HR analytics as HR practices enabled by information technology that employs descriptive, visual and statistical analyses of data pertaining to HR processes, human capital, organizational performance and external economic benchmarks in order to establish business impact and enable data-driven decision-making.HR analytics is about analyzing the data and information within organization to solve employee problem and to forecast future operation. It is an application of statistics, modelling and analysis of employee-related factors to improve business performance. Thus, HR analytics has become a standard tool for most HR managers as a data-driven method of improving decisions that has impact on HR functions. The data-driven approach that characterizes HR analytics is consistent with the development of organization.

HR analytics depends on the quality of the data and information collected from HR metrics, such as time to hire, time to fill vacancies, application dropout rate, turnover rate, retention rate, absenteeism rate, training expenses per each employee, employee relation and engagement and human capital risk. There are many benefits of HR analytics, namely, improve hiring process, reduce attrition, productive workforce. HR managers and executives are paying attention to collect and analyze data about their employees. Some organizations begin to use big data and data mining in the field of employee management and the transformation of HR data into successful business solutions and make use of factual information. It is a multidisciplinary strategy that combines methods to enhance decision quality and is accountable for finding and measuring important facts about employee and impact of organization performance. Hence, it is important for organizations to use HR analytics to analyze data, forecast and make accurate decisions. HR Analytics is not a new profession, but a technological advance enables organizations to enhance their efficacy and efficiency. Yet, organizations are looking for skilful HR analysts to play a role in collecting, structuring, analyzing and reporting on HR processes and data.

9.2.2 Digital Recruitment and Selection

Employees are the most valuable asset in any organization, which can influence key performance metrics as well as competitiveness. The ability of organizations to recruit and retain talented and skilled employees is the most crucial factor of organizational performance.

The recruitment and selection practice play important roles to enhance an organization's survival and success in the tremendously competitive and dynamic business environment (Kozlov & Teslya, 2017). Previously, organizations have used traditional methods to attract qualified applicants, including newspaper ads and employee referrals. Nowadays, the recruitment practice has been undergoing dramatic changes as a result of information technology development. The Internet, the information availability and ICTs have drastically changed the recruitment process; for example changing in the traditional process of job advertising, resume screening, shortlisting and communication with applicants. The Internet is one of the most popular information communication technology (ICT) methods used in recruitment.

Most organizations have been hit as hard by the power of the web and digital applications as the recruiting industry. Although there are still more changes happening, it's clear that the web and digital applications have swiftly and drastically transformed the way the recruiting functions operate. Digital recruitment is already established in the task of recruiters, and it is the field of recruiting that is the most extensive for using digital technologies from attracting potential candidates to apply for jobs, selling and advertising vacancies, screening and evaluating candidates. Most large organizations use digital technologies in managing HR mainly in digital recruitment tools. Current practice indicates that digital recruitment attracts a higher number of job applications, significantly shortens the time required to fill a vacancy and is highly cost-efficient (Evseeva et al., 2019). Technology also has made recruiting more efficient and effective in terms of the distribution of information more attractively. For example, Unilever is the multinational consumer goods company accessing worldwide has now adapted a digital platform for recruiting new employees. Now the company is fully experimenting with digital platforms like web based, mobile applications, social media and artificial intelligence for the further recruitment process. Furthermore, job seekers increasingly search for jobs through online platforms rather than through traditional methods. Halid et al. (2020) highlighted the use of technological tools in implementing digital recruitment activities have a positive impact on employee performance and the time needed to carry out all activities.

Due to their cost, time and efficiency benefits, the majority of organizations adopt digital recruiting techniques over conventional methods. The advantages of integrated recruiting systems have been extensively recognized and used by organizations worldwide. Digital recruiting is the practice of using digital technologies to effectively fill vacant jobs inside a business. Organizations may establish an infinite number of job openings for prospective applicants at virtually with limited cost through different network platforms. In light of this, organizations that post job openings on their websites and social media platforms (e.g., LinkedIn, Twitter and

Facebook) incur little costs and get quicker access to prospective applicants. Organizations also utilize their website as a way of attracting and recruiting potential candidates.

The stages of the digital recruiting process include the following steps:

(a) Identification of the jobs that must be filled.
(b) Post the job opening on the internet.
(c) Notification of open positions in the digital environment to prospective applicants.
(d) Enabling jobseekers to view current job announcements.
(e) Job seekers determine whether or not the job is a good fit for them.
(f) The applicant applies for the job through the system.
(g) The HR departments assess and filter the pool applicant in a virtual environment.
(h) The HR department conducts job interviews with representatives from manager specific departments.
(i) After selection process, HR design, a job offers (letter of appointment) and contracts.

In comparison to conventional recruiting methods, digital recruitment is an efficient practice in which the majority of tasks are completed on time. However, there are impact of the digital recruitment process includes (Table 2).

Table 2 Impact of the digital recruitment process

Impact	Descriptions
Cost	Organizations constantly strive to minimize the cost of filling job vacancies Cost differences prompt many organizations to replace traditional systems with online recruitment systems
Speed	In recruitment, the speed of filling the job opening is very important for organizations. Online recruitment can decrease cycle time and increase the efficiency of the process by allowing organizations to spend less time gathering and filtering data
Quantity	Online recruitment is extremely convenient for applicants and is available to them 24 h per day and seven days a week. Additionally, it enables users to quickly complete an online application or submit a CV for different jobs. This may be very helpful; it may encourage candidates to apply for jobs without evaluating their own credentials for each position, resulting in a high volume of applications for each job opportunity
Quality	The quality of the applicant pool is determined by the users of online recruitment. The majority of applicants who utilize digital platforms to apply for employment are computer proficient, well-educated, self-motivated people with a strong desire for success who are looking for relatively high-level positions
Diversity	The digital or online recruitment will indirectly influence the overall composition of the workforce and increase the level of diversity within the organization as well as encourage innovative and creative decision making

Source Kavanagh and Johnson (2017)

Digital Selection focuses on tests and assessments of individual applicants, which underlie the evaluation processes that enable organizations to manage their talent. These tools are used for selecting employees, as well as placement, training and development, promotions and evaluations. Tests and assessments are important for digital selection because they provide data that are used for making organizational decisions. Most organizations that seek digital expertise on selection will likely consider the term test to refer to traditional multiple-choice examinations that can be used to measure ability, personality or knowledge, as well as to skills tests, such as typing tests.

Organization-seeking assessments may be referring to these same tests, or, alternatively, they may be thinking of different types of selection procedures and tools, such as reference checks or work samples. Whatever the label, tests and assessments are job-related decision-making tools that provide information about candidates, information that organizations can use in selection. Therefore, digital selection plays an important role in selecting the best candidates for organizations.

9.2.3 Digital Human Resource Development (HRD)

Next is digital human resource development (HRD). HRD intervention is intended to encourage employee innovation and creativity, which will improve employee skills and contribute to overall organizational success. Digital HRD tools and instruments can be created in a variety of ways to enhance employee skill and abilities. Organizations must modernize core HR functions such as training and development to keep up with digital trends. The emergence of new training and development delivery methods in organizations confirms that employee performance has a significant relationship with training.

Web-based technologies have transformed the training and development function by providing a variety of delivery methods for employees to personalize their learning space, transforming learning content and delivery, enriching learning strategies, and enabling just-in-time learning as well as spatial divergence. Some organizations create their own methods with simple systems or customize the training to train their employees by using technology tools. As a result, technological literacy has developed as a fundamental competence in businesses that rely heavily on knowledge and technology. It is not just about skills, it is about bringing a genuine transformative shift in HR architecture and eco-systems, which resulted in "Human Resources 4.0" (Dehaze, 2017).

The current trends in employee digital training and development are:

(a) Mobile learning.
(b) Adaptive learning using artificial intelligence.
(c) Personalized training is the use of individual training courses and development plans.
(d) Creating a developing environment that does not interfere with creativity and provides high results.

(e) Evaluation of training effectiveness: measuring the return on investment (ROI) of training.

Employees will understand the entire structure involved in the training process with digital training, and they will be able to attend the training program for any place by attending the training class via an online platform. Digital technology plays a key role in improving organizational performance through the cloud-based network and assisting in specific activities like HR analytics, talent management analysis and borderless teams. Digital HRM is extremely beneficial to the HR process and also plays an essential part in organizational growth.

In the digital era, onerous top-down HR practices are giving way to bottom-up digital systems or applications to assist individual employees in transferring the responsibility of managing growth from the organization to the employee. The strategic focus of organizational HRM is largely on transformational HR functions, such as training and development for digital applications. Torraco and Lundgren (2020) highlighted many HRD programs, notably in the field of training and development, that have the potential to change the twenty-first-century workplace. Digital training and development include:

(a) Online learning technologies such as mobile learning apps, content archiving, and program and video delivery to users at any time and from any location are examples of learning technologies.
(b) The importance of technology and virtual HRD in work settings that are available 24 h a day, 7 days a week.
(c) The application of the entertainment and games movement to computer-based instruction.
(d) Using social media to improve employee-employer engagement and knowledge/information sharing.
(e) Using cost-effective virtual training settings.
(f) Produced employee profiles using computers to plan for future employment and to propose training for employees.

Scully-Russ and Torraco (2020) pointed out that digital HRD should also pay attention to the following:

(a) Technology impact on information security, privacy, ethics and socio-cultural context.
(b) Exploring the dynamic interplay between people, process and technology to harness their synergy.
(c) Collaborating with different disciplines such as knowledge management, information systems and data sciences to find cross-disciplinary connections.
(d) Integrating various dimensions of digital diversity into the design of research, such as national and organizational culture, individual and team thinking, traditional and contemporary modes of work and the digital gap.

Digital HRD in the future will be a balance of challenges and organizational knowledge control. Digital HRD requires a willingness to take risks and push the

boundaries of technology in order to foster community, improve employee performance and foster creativity at all organizational levels. In the context of the COVID-19 pandemic, Bierema (2020) proposes that the time has come for HRD to create a new normal by setting new standards for fairness, inclusion and health in the global workplace, as well as providing knowledge and intellectual practices to the organization. Furthermore, digitalization has the potential to profoundly alter the objective and roles of HRD experts, who are responsible for supporting workplace learning, improving job performance and enabling organizational growth and transformation.

Training and development aspire to enhance present or future employee performance by improving an employee's ability to perform via learning, usually through modifying the individual's knowledge, skills, abilities and other qualities (KSAO). Digital training, also a subset of distant learning, is made up of procedures and applications that make use of digital and virtual learning environments. The capabilities of today's digital application such as learning management software that is usually bundled into a learning management system (LMS) range from training administration to training and talent management.

Learning material is created with the assistance of e-learning information and communication technologies by transferring online content to digital media through multimedia tools such as the internet, intranet and extranet, as well as audio, video, interactive television broadcast and mobile apps. As a result, it enhances the quality and effectiveness of training by tailoring it to job requirements. Besides that, compared to conventional training and development, digital training, development activities can be provided at a lower cost.

9.2.4 Digital Performance Management

Performance management is an official system for examining and evaluating of task performance individual or group in organization. Performance evaluation has been one of the main contributors to organizational success in recent years. Performance management data is linked to several other systems, including rewards, staffing, training and development, and career development. Digital performance management is a tool used by managers to motivate employees to perform well in their jobs. That instance, as a consequence of digital performance assessment systems, all data on performance goals, reconciliations, standards, performance issues and evaluation findings are stored in digital data centres, saving time and effort for HR experts. Digital performance management streamlines performance measures by recording data such as quantity of finished work, time spent on tasks and error rates. For example, in 360-degree assessments conducted through intranet networks in organization, all evaluators are requested to provide an online performance review of the individual being evaluated by email. Hence, the assessment data are integrated to give feedback to the assessed individual and to assist them in improving their performance.

The fundamental purpose of performance management is to define and communicate individual responsibilities, anticipated outcomes, necessary behaviours and

competencies, as well as to ensure that individual behaviour and goals are aligned with the organization's strategic goals (DeNisi &Murphy, 2017). In addition, performance evaluation may stand out among HRM functions that organizations attempting to address the strategic challenges of digitalization may use to assist leaders in encouraging workers to engage in creative and innovative work behaviour (Curzi et al., 2019). An interesting debate about performance management practices has erupted, with some questioning the effectiveness of traditional performance appraisal and others speculating about changes in performance management and performance appraisal as a result of work and organizational digital transformation. Performance management is a critical component of HRM because it establishes individual roles, objectives and expected behaviours with the ultimate aim of aligning employee' behaviour and goals with the company's strategy (DeNisi & Murphy, 2017).

Digitalization and HRM studies have focused on electronic performance management systems, specifically on how computerized and digital performance measurement and feedback may affect the efficiency of the performance management process in terms of cost and time, as well as employees' reactions to performance appraisal. At this moment, scholars suggest that performance management systems should exhibit a stronger output orientation (i.e., a greater emphasis on achieving objective goals rather than on predetermined behaviour, time spent at the office, and long working hours) and a greater concern for employee development in order to assist employees in meeting competency requirements.

9.2.5 Digital Reward and Recognition

The term digital reward and recognition refers to web-based software solutions that allow managers to create, run and communicate pay reward and recognition plans efficiently inside their organizations. When an organization makes the best use of its financial resources, it is more likely to improve its efficiency and push its performance to new heights. In contrast to conventional compensation systems, digital reward and recognition is a strategy that combines the most efficient and effective use of an organization's financial resources as well as its capacity to distribute pay to people in an equitable and fair way.

Recognition is an award to an employee who shows outstanding performance. Recognition practice is one of the employer initiatives to recognize employees' achievement, excellent behaviours, anniversaries and milestones. The employee will receive an award that is not financially but psychologically beneficial. The introduction of new technologies in recognition has encouraged employers to give meaningful appreciations, celebrate shared success and drive employee engagement. There are many different ways to recognize employees publicly by using digital platforms such as internal employee newsletter, internal communications platforms such WhatsApp, social media posts, press releases, shout out during online meetings, post at organization blogs or websites about employee's success. The motivating effect of recognition programs may be significantly enhanced by using websites where workers can go online and find out where they stand in relation to other qualified employees. Every

employee wants employers to recognize their contributions and achievements to stay motivated and stay longer with the organization. Employees will work harder if they feel their efforts were appreciated by their managers or supervisors. Additionally, employees felt that being acknowledged by employers will enhance their relationship and build trust.

9.2.6 Employee Engagement

Previous studies have analyzed the impact of digitalization on employees. Lager and Milojkovic (2018) examined how businesses might use digital solutions to manage employees worldwide and discovered that surveys on employee digital engagement boost employee involvement in corporate activities. Fedorova et al. (2019a, 2019b) have studied the relationship between digitalization and employee performance. They found that higher performance achievement resulted in a reduction in daily activities and human error, ensuring the active participation of employees in applications through digital HRM and thus increasing employee satisfaction. Traditionally, individuals were expected to work for the same company as a full-time employee for their entire careers. Loyalty and longevity were significant predictors of professional advancement. Managers determined everything about what, where and how work should be performed.

Businesses in the twenty-first century require the majority of their workforce to be engaged in order to compete and stay ahead in their industry. Employees who are engaged are motivated, passionate and invested in the company. Their objectives are in line with the company's objectives, and they want to see both themselves and the organization succeed. Those who are not engaged, on the other hand, are the opposite sides. They are merely passing the time and are uninterested in their work. This group may become actively disengaged, spreading negative energy among co-workers and contributing to an unhealthy company culture. Investing time in engaging the disengaged percentage is an effective strategy for improving performance and sustaining organizational growth. A motivated workforce is a company's most valuable asset. Adopting a digital workplace can increase engagement by:

(a) Allowing employees to communicate and collaborate more easily.
(b) Investing in training and development, and utilising technology to make it enjoyable for both employees and managers.
(c) Making documents accessible from a single location and ensuring their ease of access, which improves user experience and increases use of digital platforms and engagement.
(d) Providing organizations with the ability to measure engagement, conduct pulse surveys, and stay up to date on your employees' well-being and happiness at work.
(e) Creating a virtual company culture by displaying company values where all employees can see them and incorporating values into daily tasks.

9.3 The Roles of Human Resource Managers in Digital Human Resource

Organizations' external environments are constantly and rapidly changing as a result of digital technologies, which has increased the importance of human resource management (HRM) as a means of effectively implementing business strategy, achieving goals, remaining competitive and remaining flexible. Therefore, HR managers are confronted with new difficulties in terms of successfully executing the traditional daily tasks (administrative task) as well as performing new strategic roles that are in line with the requirements of modern businesses. Ulrich (2012) defined six roles of HR managers to be adopted by HR managers in order to face the challenges in the new business and work environment. These six roles are as follows (Table 3).

One of the HR roles (technology advocator) above is specifically focused on technology in which HR managers need to adapt to every change related to HRM in order to manage employees, to perform daily operations and achieve organization performance. Furthermore, the requirements of modern digital organizations are really forming the new responsibilities of HRM, whose primary goals are as follows (Torrington et al., 2020) (Table 4).

In addition to the conventional roles, the role of advocating, managing and implementing the consequences of digital technologies, to carry out the operational tasks of HRM to lower cost, with more monitoring and greater accessibility for employees. At present, most HR functions such as HR planning, recruitment and selection, training and development, reward and compensation, performance management and career utilize technology on a regular basis.

Table 3 Roles of human resource manager

Position	Roles
Strategic positioner	Assists the development and implementation of business strategies
Credible activist	Creates business decisions and accomplish tasks
Capability builder	Contributes to the development and maintenance of skills that are consistent with organizational values
Change agent	Contributes to the development of organizational capability, overcomes employee resistance to change and ensures the required resources
Human resource integrator	Initiates and integrates HR practices according to organizational strategy
Technology advocate	Utilizes social networking technology and systems to assist employees and contribute to the effective management of information

Source Ulrich et al. (2012)

Table 4 Role and objectives of human resource manager in digital HRM

Role	Objectives
Strategic	**Staffing objectives** One of the primary roles of HR managers is recruiting and keeping employees with the appropriate qualities and required abilities to perform in a labour market where rivals are also searching. They also must create an organizational structure and develop a strategy for market differentiation and positioning to achieve staffing goals and meet current trends. Nowadays, HR managers have to gain knowledge and learn various digital platforms in attracting and recruiting potential employees
	Performance objectives To achieve organization goals, every organization must train and develop, empower, dedicate, motivate and adequately reward their employees properly. HR managers have the difficult task of creating an atmosphere, in which employees are not only capable of meeting performance goals but also want to go the extra mile. The HR manager's job also includes enforcing disciplinary rules and procedures to guarantee that underperformers get fair punishment
	Change-management objectives In a business environment, change is unavoidable, constant and deadly. For an organization to survive and remain competitive, it must be able to effectively deal with future difficulties and embrace transformation. HR manager has to make strategic decisions, develop and participate in transformational HR functions to successfully manage the change process, including employee response to the change, agents of change and implementation procedures
	Digital HRM objectives Organizations shape work via the use of information technology such as virtual teams, outsourcing and networking collaboration. Human Resource Information Systems (HRIS) is used to access, collect, retrieve and analyze data on individual and team performance. HRIS is an effective method for gathering, storing and analyzing data related to HRM data and information in order to implement systems and practices that improve productivity, retain talent, forecast staffing requirements, and most often activities are to attract, recruit and select new employees. Organizations gather data about employees and improve employee engagement by using networking and internet technologies through networking devices and websites. People analytics are being improved by artificial intelligence and machine learning
Operational	**Administration objectives** This role contributes to the smooth operation of an organization such maintaining records of employee performance, attendance/absence, developing and implementing training programs, and monitoring and executing reward/payment procedures, ensuring compliance with the law (maternity leave, sick pay, the safety system and working conditions) and enables organization to make logical and equitable decisions. Managing administrative tasks professionally and effectively can help an organization gain a competitive edge over other organizations that are less efficient in their administrative processes

(continued)

Table 4 (continued)

Role	Objectives
	Reputational objectives Information and communication technologies (ICT), in particular the internet and social media devices, enable networking and changing information about organizations extremely easy for individual employees, potential employees, consumers and suppliers. Organization information about rules, procedures, ethics in the workplace, compensation, interactions with employees and the integration of work and personal life. HR managers are responsible to help organizations, build and maintain a reputation for operating ethically, abiding by the law and promoting employee well-being

Source Torrington et al. (2020)

9.4 Changing in Digital Human Resource Management

The year 2021 was full of unprecedented changes, volatility, environment uncertainty and complexity that affected most organizations in the world. The process of HRM in organizations needs to adjust from the traditional HRM to the digitalization HRM (Jin, 2021). Furthermore, the pandemic COVID-19 one of the unprecedented situations in the world that changes 360° of the HRM, proceeds in an organization. As before this pandemic situation, HR managers conveniently apply the traditional HRM. However, when this environment uncertainty hits the world, means HRM digitalization becomes the priority for organizations to ensure that the process of HRM is going well (Cafferkey et al., 2019). While this system transforms from traditional to digitalized, digital HR has become an important function for the people and organization. In this section, we will discuss the three major areas in which human resources need to acquire or enhance their function, and, which are directly linked to achieving success on the digital transformation path.

The recent vicissitudes brought by the worldwide pandemic COVID-19 have forced the organization to come out with the strategic planning to accelerate transformation from traditional Human Resource Management (HRM) to the digitalize approach. This extraordinary shift can give a mixed feeling for the organization especially when it incurred some financial and non-financial support. Moreover, strategic planning should be involved at individual, team and organization level even though it is a small or large based organization (Ruël & Bondarouk, 2014). For instance, the employees need to upgrade their knowledge, skills, and abilities to obtain this HRM Digitalize especially in recent unexpected crises in organization and business continuity. Hence, the strategic planning by the HR managers should consider the readiness of the organization instead of looking at the trend only. Markedly, the priority for HRM Digitalization is the strategic planning because it must be the "stepping stones" including the analysis part for pre-HRM Digitalization. Significantly, past research found that the HR manager should produce a strong and concrete planning on why the organization should tune to this digital platform (Cafferkey et al., 2019). Thus, employees will be happier to attempt the HRM Digitalization if there is a robust

strategic planning from the HR manager for all individual, team or organization levels.

9.4.1 Re-structuring the Organization to Enable the Digital Human Resource Management (HRM)

Prior to embarking on the transformation, every organization's leadership team must agree on what digital means to the organization and how it will fit into the broader business strategy. This alignment will influence the organization's digital operational model, which comprises digital capabilities such as processes, people and technologies. Human resources have the responsibility of identifying the organization's future digital capabilities and determining where such capabilities should be implemented. There are five main areas of digital capabilities (Table 5).

After defining the capabilities required, HR needs to support its organization in linking those capabilities to specific roles and responsibilities

9.4.2 Digital Talent Management

The year 2021 was full of unprecedented changes, volatility, environment uncertainty and complexity that affected most organizations in the world. The process of HRM in organizations needs to adjust from the traditional HRM to the digitalization HRM (Jin, 2021). Furthermore, the pandemic COVID-19 one of the unprecedented situations in the world that changes 360° of the HRM, proceeds in an organization. As before this pandemic situation, HR managers conveniently apply the traditional

Table 5 Areas of digital capabilities

Digital capabilities	Descriptions
Strategy	Determine the role that an organization wants to play in the digital space Determine what will digital contribute to the organization's value Determine the strategy for organization to succeed in the digital age
Planning and operations	Determine how will digital plan, operate, monitor and track value captured
Product or service development	Determine technical skills required for product or service development
Innovation	Determine skills are required to generate the innovation in order to achieve the digital operating model
User experience	Determine skills are required to comprehend the requirements of customers in a digital platform

Source Deloitte (2016)

HRM. However, when this environment uncertainty hits the world, means HRM digitalization becomes the priority for organizations to ensure that the process of HRM is going well (Cafferkey et al., 2019). While this system transforms from traditional to digitalized, digital HR has become an important function for the people and organization. The talent management plan should be directly linked to the digital strategy of the organization supporting HR in filling the gap between current and future digital competencies. HR plays an important role in managing the employee in a digital environment, from acquisition to development and retention.

(a) **Human resource planning and staffing**

Attracting the most qualified talent depends on developing an employee value proposition. Digital expertise is scarce and organizations often struggle to find the required skills in the labour market. Organizations promote and advertise digital positions in the labour market to get qualified employees. Besides that, the recruitment process should portray the organization as digital brand utilizing innovative solutions. In a competitive climate where supply is limited and demand is rising rapidly, HR's role is essential in developing recruiting channels and messaging to promote contemporary organizations. HR should prioritize recruiting people who are technologically smart and socially conscious, since they will be critical for businesses in the future.

(b) **Human Resource Development**

Organizations should foster a learning atmosphere and invest in their existing capabilities. HR functions are responsible for developing and delivering education programs via a variety of platforms, as well as empowering employees to be responsible for their development plans, not only for developing technical skills but also for adapting to and developing new ways of working that align with the organization's digital strategy. Furthermore, HR has a role in further up-skilling employees about the cultural change due to digital transformation. A digital culture welcomes knowledge and insight and values autonomy, entrepreneurship and innovation. As a result, it fosters an environment of openness, opportunity and trust, enabling the organization to be adaptable, flexible, and sensitive to change.

(c) **Agile Internal and External Workforce Engagement**

An organization that followed the trend was becoming the new organizational paradigm. The efficient work and task come from the agile workforce engagement, which becomes critically important in any organization. The readiness of the employees should be counted because it is basically for growing and development of the employees and organizations as well (Neumeyer et al., 2021). The agility includes both internal and external workforce engagement, and it is possible only when people feel empowered, willingness to change and readiness to adopt and adapt the new knowledge and skills. Hence, the HR manager should place the priority in this matter by having people who can move to the HRM Digitalization. Moreover, the HR manager must prepare the manpower by giving the training to those needed as well as continuous workforce reskilling (Jin, 2021). For instance, the organization should consider the better platform where employees can engage among them

quickly and be able to manage effectively which leads to business agility and efficiency. The process of moving from one phase to another is not easy and open to any risk as well. However, the HRM Digitalization continually growing and being the competitive advantage for the organization, which is applied to it. By having an agile workforce, the expanding of organizations becomes meaningful and creates a better experience and expectation for the organization to grow (Cafferkey et al., 2019).

(d) **Employee engagement and retention**

HR assists organizations in retaining talent by investing in employee engagement programs and making the workplace more attractive to the appropriate people at the right time. It is critical for organizations to embrace creative and collaborative methods and to promote the use of digital platforms, by providing employees with both rules and the freedom by allowing employees to work from wherever is convenient for them. However, HR managers should monitor the overall well-being of employees to avoid burdensome to employees as they are constantly connected. Additionally, organizations should provide opportunities for employees to perform well and create an impact throughout the digital transformation process and reward them for their achievements.

9.4.3 Empowering Digital Leadership

Digital leaders are essential in laying the groundwork for digital transformation and should actively interact and communicate with internal and external stakeholders throughout the design, delivery and decision-making phases of the digital organization. In order to steer their organizations through the digital transformation process, digital leaders must identify and prioritize the costs, risks, mitigations and benefits of the transition. As a result, leaders should be well prepared to lead and manage the transition process. HR is critical in empowering digital leaders inside the organization, providing them with necessary skills and enhancing their leadership qualities. The following are some of leader qualities that are suitable for leader in digital environment proposed by Ken Blanchard (2018) and other management gurus (Table 6).

9.5 Factors Necessary for Successful Digitalization of HRM

The Coronavirus COVID-19 was the major turning point for the organization to tune from the traditional HRM approach to the digitalization platform. This crisis brings a new working experience especially for the Human Resource department in order to make sure all employees are still on the track. This change had built a new HR operation model, and employees had experience to enhance the organization's ability of the company (Briken et al., 2017). So, the HR department must be innovated simultaneously to support the digital transformation of enterprises. This approach is

Table 6 Leader qualities in digital environment

Leader qualities	Descriptions
Adaptability	Flexible and adaptable—giving people freedom to innovate and allowing them to perform work based on their preferences and styles
Tolerance	Encourage innovation and the exploration of new concepts and ideas
Mobility	Promote the use of digital technologies and media and encourage the use of flexible and contingent work schedules
Communication	Maintain a high degree of visibility, accessibility and communication with peers across levels
Decision-making	Establish the appropriate teamwork to provide critical insights as needed Be able to make quick analytics-based decisions
Feedback	Provide real-time feedback and reward individual and team achievements

Source Deloitte (2016)

already in the marketplace and the HR practices must look at the successful factor on it.

The development of Human Resource Management (HRM) in digitalization is capable of quickly brings the HRM process to the advanced stages. According to Meske and Junglas (2020), the HRM digitalization also can propose reasonable solutions especially in the intra-organizational HR process. For instance, there are three main areas of influence of digital technologies on the sphere of HR management (Jin, 2021) such as digital workforce, digital workplace and digital HR management. Moreover, each of these elements brings successful digitalization of HRM in the workplace.

9.5.1 Digital Workforce

Firstly, the digital workforce refers to the team of software that works alongside human employees to undertake manual processes and allow humans to focus on value-added tasks (Briken, 2020). In order to get the process in an advanced stage, this digital workforce is the best approach to be applied in organization (Connelly et al., 2021). Moreover, this digital workforce could be applied either in the small or large company based on the capability of the organization in terms of resources. For instance, the organization can introduce the new management digital approach, the new culture digitalization, training sessions for the new transformation and create an opportunity for all employees to use that. Hence, the digital workforce will require a readiness from the employees to make it happen in the organization.

As an organization, the employee experience has become the main element to ensure that any new technology can be successful if it is implemented in the organization. The intelligent solutions among the staff are also a priority for organizations because it is related to the individual ability to think, ability to learn and understand

as well (Jin, 2021). Today, technology has gone beyond information and communication permeating different areas of life. Even though the digital HRM has been recognized worldwide, the prior should be the bunch of the experience of each organization (Cafferkey et al., 2019). Some of the manpower in the organization already have their experience in using the Digitalize HRM from the previous organization perhaps. However, not all the staff have been through the system before and that should be highlighted under the experience of the organization. The level of experience is different from one to another organization. It is not only based on the organizational experience only but the individual experience as well. Hence, the experience from both individuals and organizations had to be put as the prior because it can produce different outcomes for the organization later. That is why before the HR manager proceeds to the next step, this should be a look first to ensure that either the organization is compatible to get the new HRM Digitalization system or not (Luo, 2021). Therefore, the intelligent solutions are important to HR managers to have a look because it can be vice versa later on.

9.5.2 Digital Workplace

The digital workplace is known as a virtual and modern setup from the traditional approach. The application and task would be the same but in the advanced approach by using a digital platform in communication and working purpose (Jin, 2021). The digital workplace provides high security in order to maintain the information privacy and security. The security in HRM digitalization includes the databases, employee's personal information and privacy information of the organization (Mosca, 2020). Today, this approach is a must for organization and brings success instead. The digital workplace enforces the HRM department to tune it from the traditional HRM to the Digitalization HRM. This could have happened if the organization also applied the digital workplace for other operation parts. If the organization is not considered as the digital workplace, thus it is impossible for the HRM digitalization to be applied (Mosca, 2020). Hence, when the workplace already changes to a digital workplace, it gives benefit to the HR manager to conduct the HRM digitalization because the organization is considered as ready to get this new transformation. Thus, the digital workplace is one of the factors necessary for successful digitalization of an organization.

9.5.3 Digital Support Management

The digital Human Resource Management (HRM) is a process that optimizes the use of online platforms to leverage the HRM process in organization. This platform gives an efficient, effective and competent HR process as well as to sustain the performance of the HRM department in the organization (Hosain, 2017). In addition, the HRM digitalization can give a new experience to the employees for them to explore it in daily uses. However, it does not mean that all employees are ready and accept the

changes immediately. It takes time, however, slowly but surely, they will accept it without any arguments (Mosca, 2020). Hence, the digital HRM will build a new working experience for all employees in the organization, and it will help to build the business reputation as well.

9.5.4 Updated Digital Technology

Human Resource (HR) digital transformation distinguishes as one of the opportunities for the company to redefine people management in order to catch up with world-class performance (Fedorova et al., 2017). The digital transformation bits upon all aspects of organizational life and permeates organizational practices. For instance, HR executives have started using artificial intelligence in order to run the HR process using this digital platform (Van Esch & Black, 2019). Hence, the HR executive must apply the transformation in order to support the organization and shape the corporate culture in order to move the company to the next better level. Thus, strategic HR could be applied in order to support the company's digital transformation. Strategic Human Resources (SHR) included attracting the top talent, hiring the best employee for the company, on-going education, training and development program, career path and developing a better culture intra organization (Cooke et al., 2020).

9.5.5 Human Resource Tactical in Recruitment

Recruitment by using the digital transformation has stimulated from a tactical Human Resource (HR) activity to a strategic business priority. This situation drives the competitive advantages of the company in order to get the best workers for their organization especially for the large company. According to Kemp (2018), about 3.2 billion people from age 18 to 35 years old in the United States are active in social media. Based on that, the number of job candidates spending their time in digital space also increases. Therefore, the organization can recruit new employees in that digital space with digital technologies and tools. Moreover, the digitalization of job information from both organization and potential employee could reach easily and the matchmaking process becomes smoothly (Neumeyer et al., 2021). In addition, the HR manager can view the potential candidates' profile by using this digital platform. According to Hosain (2017), the recruiting technologies now go beyond just screening resume to conducting virtual interviews. The HR manager can easily run the recruitment process using this digital platform, and it is more convenience. Thus, this HRM digitalization is developing innovative and agile culture to the HR department specifically, and it can give a convenient working experience generally to all the employees in the organization as well.

9.6 Benefit of Human Resource Management Digitalization

The rapid growth of Human Resource Management (HRM) digitalization increased the digital performance in organization and gave impact directly and indirectly. Due to the pandemic COVID-19, the Human Resource (HR) can simplify the process of accessing to all employees' by using the digital platform. As in the crisis, most of the employees Work From Home (WFH) and the HR can be detected by the employees easily by using this approach as well (Luo, 2021). The digital revolution pressures the organization especially in the HR process because everything is speedy moving (Ahmed & Ogalo, 2019). In addition, just as employees like to be able to choose how and when they manage their professional workloads and tasks daily or weekly. Hence, this HRM digital platform gives more benefit to the users either for small or large organizations based on their preference.

9.6.1 Environmental Performance

Environmental performance is defined as an efficient environment eco-friendly for the organization regarding the environmental responsibility (Rao & Holt, 2005). Most of the organizations in this industry apply the environmental performance initiative in order to be in the competitive advantage. The online platform in Human Resource Management could help the organization in reducing the waste product especially in papers because the HR department can apply the online recruitment process. As we know, traditional recruitment involves the hardcopy of a resume which the applicant must send it by post. However, by using the Digital HRM approach, the applicant can send it through the email as well. At the same time, this approach would help to save the world by reducing waste products. Hence the digital platform will help the organization to keep the information in the proper e-filing and influence the employees to be better in the environmental performance.

9.6.2 Managing Information

The access to confidential information can be meticulous by employees making sure the right information is available to the right people at the right time and situation. For instance, a certain person can only access to certain confidential information. In addition, digital HR can also provide document management capabilities for which an organization can learn what an employee is reading, listening and can improve productivity by minimizing strenuous paperwork, access old documents or achieve training manuals (Khashman & Al-Ryalat, 2015). Thus, this gives the competitive advantages for those who applied the digital HR in the organization.

9.6.3 Intra-Organization Communication Platform

The digital HRM is a solution for establishing an effective communication channel because it enables the organization and its employees to connect and communicate with anyone at any time. HR experts can encourage departments to easily communicate via instant messaging platforms such as Microsoft Teams or Slack, and remote employees can easily communicate and stay up to date on business changes. While allowing your employees to choose their preferred modes of communication, the digital workplace also allows them to be creative, share ideas, and provide feedback. Furthermore, improved communication aids in the resolution of conflicts, the development of a strong company culture and employer brand, and the development of stronger employee and customer relationships.

The digital transformation changes the way the HR team works and interacts with the employees. The performance of employees becomes better because this platform could provide flexibility in working conditions (Ruël & Bondarouk, 2014). Moreover, this digitalization HRM is used as an intra-organizational HR communication among the employees and makes the communication process easier. Throughout the pandemic, this approach was better adapted to support employees on their career path and became evident and urgent (Khashman & Al-Ryalat, 2015). For instance, this system provides notification to ensure the instruction and activities are completed at the right time. Hence, this could be more efficient for employees to communicate intra-organization easily and productivity.

Digitalization processes have helped create effective internal communications, automating processes of information exchange and reporting, reducing operating expenses, teleconferencing, speed, ease of documentation, less paperwork, ease in collecting comparative data, improved performance, etc. The integration of digital technology into business processes is said to be crucial for the survival and competitive advantage of contemporary organizations (Fedorova et al., 2019a, 2019b; Fenech et al., 2019).

9.6.4 Strategic Management Capability

The digitalization of Human Resource Management (HRM) also gives benefit to the organization as well because this contribution could improve the HRM's strategic management capability as the whole organization. Under these circumstances, the effectiveness of HRM digitalization is more likely to be heightened. Moreover, when the HR manager plans a strategic management involvement for the organization, this can encourage employees to actively participate in the HRM digitalization "by hook or by crook". Thus, this HRM digitalization can amplify the positive impact to the organization in enhancing firm performance.

9.6.5 Sustainable in Business Performance

Other than that, the HRM digitalization contributes to sustain the business performance. This digital platform is widely used by leading firms all over the world and it is widening gradually. Moreover, the HR managers can link with the other HR managers, which share the same tasks as in the branches approach (Ruel & Bondarouk, 2014). For instance, if the company is an international organization, it basically has a HRM department for each branch in different countries. Hence, all the HR managers in each branch should discuss together and make the decision by guiding from the HR manager in the head of department. The employees just have to use the digital platform to ask or respond to others rather than make an appointment and have to wait for the specific time arrangement (Briken et al., 2017). Hence, this HRM Digitalization approach gives a better opportunity to all the employees in a better experience way.

9.6.6 Fair Treatment in Human Resource Management Practices

Next, the digital platform for HRM could reduce the human bias benefiting everyone through standardized operation. This applied to fair treatment from other people because everything via online application (Connelly et al., 2021). For example, the recruitment process could be fair when the candidates submit the application and the organization puts it in the pool platform. Thus, other respective people also can view it for the perusal actions. According to Ahmed and Ogalo (2019), the recruitment process will be better if the organization uses the HRM Digitalization, and the application also will increase due to that easy approach in applying for the job.

9.7 Digital Human Resource Management (HRM) Challenges

Today's digital environment, digital HRM takes a significant role as compared to traditional HRM, and this is because of the demands of businesses. Many organizations need high-performance digital HRM systems in order to function effectively as a whole. The HR department must embrace change in HR and update its policies to reflect the requirement for digital transformation. Furthermore, drastic changes in HR processes could be challenging for the company because digitalization needs some time to be stable enough to be applied (Meske & Junglas, 2020). Hence, it is not going smoothly for all the employees as well because the HR must consider many certain unpredicted causes or problems that might happen. Thus, exclusion may result from the unequal access to digital technologies (DiMaggio et al., 2004), technologies tools and the experiences in conducting that platform.

9.7.1 Information Security and Privacy

There are many advantages to using digital technology, but there are also many drawbacks. These include the issues and legislative limitations related to information security, privacy, as well as the negative consequences of being digitally linked 24 h a day and 7 days a week. While big data has the potential to be more objective and accurate, they are also extremely subjective and contextualized. There are inherent ethical issues related to privacy, use of data and employee relations that must be addressed. Other than that, the norms of the electronic media are vulnerable and may be attacked by viruses from anywhere on the internet. The virus can be disabling your HRM Digital platform and may disturb the system as well. The Digital HRM is subject to corruption, hacking, data losses or breakdown at any time. Hence, there must be a possibility to have continuous problems onwards (Ahmed & Ogalo, 2019). Thus, the digital platform needs to have a traditional HRM backup in order to ensure that the privacy and important HRM information are safe if any urgent matters happen.

9.7.2 Employee Safety and Health

Human Resource Management Digitalization involves such as paralysis due to information overload, increased employee stress levels and social isolation. Besides that, employees who are forced to answer business-related emails and phone calls during their personal time miss out on relaxing and spending quality time with their families. Excessive email usage has been linked to higher levels of stress and job overload.

9.7.3 Cyber-Loafing and Cyberslacking in the Workplace

Because technology is eroding the lines between work and non-work life, employees are increasingly utilizing technology at work for personal purposes and bringing their personal devices to work posing significant security concerns. Cyberloafing was first operationalized by Lim (2002) as personal emailing and surfing activities that employees freely engage in while on the clock at the office. Cyberloafing included both small activities such as browsing, e-mailing or online shopping and major behaviours such as gambling, online gaming, blogging and visiting adult websites (Henle & Blanchard, 2008). Researchers believe that cyberloafing may lead to decreased job satisfaction since it can be a kind of disengagement behaviour or even a form of procrastination in the workplace (Farivar & Richardson, 2021). While social media is often utilized in HR activities like as recruiting and selection, it raises a number of ethical, legal, fairness, privacy and cyber-loafing discrimination/issues that must be addressed by HR managers.

9.7.4 Shifting Work Process to Digital Platform

Digital HRM faces numerous difficulties and challenges in order to provide the highest level of work quality to organizations all over the world. To succeed in a competitive structure, organizations must increase their global trading. However, it is challenging for HRM to adapt to a digital transformation and cope with complexity while transferring work processes and their development on a digital platform. Organization has a tough time adapting to a digital revolution. In today's environment, digital employees have to play a critical role in the organization and other company operations by generating momentum and internal capacity.

Digital has been a driving force of change across industries; and the transformation is accelerating—it took 5 years for Apple to transform the music industry while Uber and Airbnb profoundly reshaped the transportation and hospitality sectors in less than 2 years. One can measure the pace of digital disruption in months while it takes years for an organization and its people to fully embrace such fundamental changes in the way they operate. Change management is by far the most enduring bottleneck to digital transformation. While technology adoption continues to be top of mind in all digital things, we advocate in this point of view that fundamental changes in leadership and talent attributes are far more critical to successfully embark in the digital journey.

9.7.5 Employees' Reactions to Change

Introducing new technology into your organization is an investment that will provide your employees with new resources to help them do their jobs more effectively and efficiently. New technology, on the other hand, means change for your workforce. People are afraid of the unknown, and implementing a new working environment may cause uncertainty within your organization, leading to employees becoming resistant to the change. The most common reasons for resistance to new technology adoption are job security, fear of failure, the unknown and organizational distrust. Baby boomers and Generation X, for example, may be more resistant to technological change than millennials. Millennials are accustomed to and use technology in their daily lives. It is uncommon that you will need to train them to use a laptop or a smartphone; however, later generations may find it difficult and require additional training. This may deter people from using new systems because they are less confident or feel embarrassed.

Technology that automates low-skill repetitive tasks frees up HR personnel to work on higher level, potentially more valuable tasks. This may come at a cost for some in the HR department, who may be resistant to change out of fear of losing their jobs. This fear is not unfounded; according to a 2019 report on job automation by the Office for National Statistics (ONS), "around 1.5 million jobs in England are at high risk of some of their duties and tasks being automated in the future."

9.7.6 Maintenance of Human Resource Management in Organizations

The Human Resource Management (HRM) Digitalization involves a high cost to maintain and implement especially for the small company. As we know, to buy a certain software for an organization incurred by a large capital form organization does not matter if it is a small or large organization (Connelly et al., 2021). Furthermore, the organization needs to invest more on digitalization training and development before adopting this HRM Digitalization (Khashman & Al-Ryalat, 2015). This could be an additional cost for the organization to make sure the staff are capable of using it. Hence, the cost for the system and maintenance could be the disadvantages somehow to certain organizations.

9.7.7 Ageing Community in Conducting the Transformation

As we are aware that the digital HRM is a computer-based approach and still needs the human power to run the system. The computer and their associated program are only as effective if the user had an experience to conduct it. For instance, if the employees never experience applying online leave, then there might be any mistake in filling in an online form for the first time (Jin, 2021). Furthermore, for the ageing community, some of them are reluctant to try this new digital platform and it could hinder the organization to fully transform to the digital approach.

From the perspective of misunderstandings and dilemmas, the aging society would be difficult to adapt with this HRM Digitalization in organization. This society involved the older adults in organization, which continually being healthy and active participants in evolving digitalized situation. However, for them to change from traditional HRM to Digitalization HRM could be a difficult path especially for those who will be retired soon (Connelly et al., 2021). Hence, it could be disadvantages for them if they are not ready yet to follow the trend and make changes. Thus, the organization must deal with this issue in order to make sure all level age society could be used this HRM digitalization as well.

10 Conclusion

Digital Human Resource Management (HRM) is considered as an important aspect of business organization. Every business organization has a long way to go by adopting digitalization. Digital HRM helps in maintaining a strong relationship between management and its employees. By preparing a strategy for digital HRM will help in organizational performance. This chapter highlighted the importance of digital HRM in the aspect of the organization and by enhancing the HRM practices, recruitment and selection, training and development, performance appraisal, reward and recognition and career development. Every organization should develop its digital strategy to improve productivity. In the current scenario, digital HRM is considered a growing

research topic as well as an important topic for a business organization. With the use of digital HRM practices and through social media, the internet, artificial intelligence and other technology organizations can maintain their performance and employees' quality standard for the smooth running of the organization. Digital HRM enables the use of data analytics, improve the employee experience, offer self-service tools and be competitive in market. Therefore, to remain relevant and competitive in the global market, organizations have to alert and understand the dynamic of the business environment, follow the current trends and take action to ensure embrace digital HRM.

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Strategic Human Resource Management: Importance of Tangible Analysis of Indicators

Marco Fernandes and Pedro Novo Melo

Abstract Human Resources Management has proven to be a relevant area in modern management companies, and its strategic positioning in certain may reveal the potential that it may have in its success and performance. Part of this factor is related to the transition of the human resources department in the organizational paradigm, from a cost perspective necessary for the smooth running of the organization, to an investment perspective where managers feel comfortable investing without expecting results in the short term but expecting potential surplus value in the future. This significant change allows the emergence of new strategic approaches and can facilitate the approach of the HR department with other departments, in what refers to the techniques used and the symbiosis between all parts of the organization. This work addressed the concepts of human resources indicators analysed in a strategic aspect with *HR Analytics, that* appears as an attempt to measure something that in its nature is subjective: human capital. This study aims to address the concepts and its applicability in organizations. For this purpose, the studied population consisted of five case studies of technological companies, the data collection was done through semi-structured interviews and their analysis was accomplished through a content analysis. The main results indicate that there is an awareness of technological companies for what *HR Analytics* represents and what is in its genesis, with all companies showing to be aware of the trend, identifying their added value. However, it appears that most of the analysis is positioned at a descriptive level, not promoting advanced analytics from a predictive or prescriptive point of view. It is also possible to state that there is a discrepancy in what refers to the type of metrics analysed and the structure that processes them, being a phenomenon originated by several factors such as the size of the company, its business sector and the maturity of its analytical system.

M. Fernandes
School of Management, Polytechnic Institute of Cávado and Ave, Barcelos, Portugal

P. N. Melo (✉)
School of Technical Short Cycles, Polytechnic Institute of Cávado and Ave, Braga, Portugal
e-mail: pmelo@ipca.pt

Interdisciplinary Centre of Social Sciences – CICS.NOVA.UMinho, Braga, Portugal

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1 Introduction

Human Resources Management has proved to be an area of enormous importance in companies and its strategic positioning in certain organizations reveals the potential that it can have in their success and performance. Part of this factor is related to the transition of the human resources department in the context of the organizational paradigm, from a perspective of the cost necessary for the proper functioning of the organization, to an investment perspective where managers feel comfortable investing without expectation of results in the immediately, with the prospect of potential generation of added value in the future. This paradigm shift allows the emergence of new strategic approaches and can facilitate the approach of the HR department with other departments, which refers to the techniques used and the symbiosis between all parts of the organization.

In an increasingly globalized and competitive labour market, it is essential for organizations to capture and develop the best human capital at their disposal. If, in the second half of the twentieth century, individuals with long contributory careers were observed only in the same company and in the same function, today there is a greater rotation of job positions and the younger generations, namely the Millennials, are more demanding in terms of assessment what the employer has to offer.

In addition, there is yet another phenomenon, accelerated by the technological revolution, which is characterized by a growing emergence of new functions and extinction of others. At a European Union conference in Brussels in April 2019, entitled "The Future of Work: Today. Tomorrow. For All" this topic was addressed in greater detail, mainly its impacts on society and our working life as we know it today. This conference highlighted the need for long-term investment, an inclusive digital economy, new labour market policies and above all that no one should be left behind, and that there should be a big focus on upskilling. It is true that the labour market is changing drastically and that there is an extinction of jobs and the creation of new roles, which had never existed, such as, for example, software programmer, data engineer, data scientist, computer programmer applications, UX/UI Designers, social media managers, digital marketing, among others. In the opposite direction, one sees jobs that have already become or are in the process of becoming obsolete due to technology, such as travel agents, a few manufacturing-related jobs in the secondary sector, cashiers, warehouse workers, fast-food chains, and several others. However, we cannot claim that this is a replacement, as in fact the jobs created are quite different from the jobs that are disappearing. It is unlikely that a travel agent, printer, lumberjack, or telemarketing agent will be able to transition smoothly into a career in software programming, at least not in the short term, without a requalification process that at best can take several months, at best. Thus, we can

state that this unique market is characterized by the fact that a large part of the competitive pressure on human resources is placed on the employer, who lives in a constant search for the best talent and the attempt to retain it in the face of competition enticement.

This article explores the concepts of human resource indicators, analysed in a strategic aspect with HR Analytics, being an attempt to measure something that in its nature is subjective: human capital. This study aims to address the concepts and their applicability in organizations. For this purpose, the studied population consisted of five case studies of technological companies, where data collection was carried out through semi-structured interviews and their analysis proceeded through a content analysis.

2 Literature Review

The term "Strategy" originates from Greek language and has its emphasis on the military art, meaning the art of leading a troop, referring to a leader or a general. Thus, the verb "stratego" meant "to plan for the destruction of the enemy through an efficient use of resources" (Bracker, 1980). This concern with Strategy, despite having primarily manifested itself in the military context, is now seen in the business domain. When applied to the field of Management, the rationalist model of Linstead et al. (2009) states that Strategic Management is based on the premise that managers can access all the relevant information needed to plan long-term decisions about the organization and have the ability to implement those decisions. In this sense, it is a process of planning. This concept offers individuals in the decision-making position a guide that supports their decisions related to managing the organization. This process is not static, so it is constantly changing and developing due to changing external factors as well as changing paradigms that indicate the best reliability of the organizational path.

With regard to Strategic Management, it is possible to indicate that there are several approaches to the planning and execution of strategic management, however, according to Gamble et al. (2015) they generally comprise five levels:

- **Contextualization of the company**: establishing a guide through the articulation between the organization's vision, mission and values. This point is important to understand how the organization perceives itself and how it wants to be perceived by the external environment.
- **Goal setting**: all individuals within the organization should have a common goal in mind. As an integral part of the long-term plan, goals allow all departments in the company to work towards achieving them collectively.
- **Creating a strategy**: Through the establishment of goals, a strategy is created that allows the previously defined goals to be fulfilled. This strategy should be easy to understand detailed and communicated to all departments in the company.

Leadership plays an important role in ensuring that everyone is working to achieve the goals set and to fulfil the strategy.

- **Applying the strategy**: As the term itself indicates, it is about making sure that the strategy is implemented as planned. This point implies the distribution of resources, developing the decision-making process and human resource management. It is important that management oversees the efforts of all departments to comply the outlined plan, however, it is equally important to make sure that everyone has assured resources so that they can focus on the common goal.
- **Strategy Assessment**: It is fundamental for the organization to carry out periodic assessments to understand the most problematic areas, measure the levels of success and check if the performance targets are being met. Establishing short-term goals is important to understand the path being followed, assess it and, if necessary, correct it. One of the tools used at this point is the SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) to analyse what changes are needed and where. Another tool used is the financial analysis that is applied before, during and after the execution plan.

Kaufman (2001) states that researchers' interest in strategic management since the 1980s has had a profound impact on the development of HRM, as research has emphasized that employees within an organization are not a homogeneous group, but a resource whose quantity and quality of output can be manipulated. In this context, Strategic Human Resource Management (HRM) emerges, defined by Dessler (2013) as the act of formulating and executing human resource policies and practices with the aim of influencing the competencies and behaviours of its employees in the direction the organization needs to achieve its strategic goals. Thus, information is needed to support the establishment of goals, the creation of a strategy and its subsequent application, and making measurable something that is naturally intangible, as in the case of human capital, is a priority for analysing information clearly and with a practical purpose.

With the emergence of integrated management systems in the cloud and powerful Big Data tools, Human Resource Management is experiencing a paradigmatic change, and it is in this sense that People Analytics appears. Large companies are starting to invest in integrated information management programmes that can combine planning, talent management or operational improvement, moving from a group of technical experts to a strategic management task that can respond positively to all company stakeholders. In short, it is about analysing large amounts of information and using it for the purpose of value creation or strategic positioning, something that was already applied in other areas of the company such as financial or commercial and that has now become comprehensive to people management as well. (Collins et al., 2017).

2.1 Human Resources as a Structural Cost or as a Source of Value Creation?

Given the historical nature of the function on an administrative support basis to the business, the Human Resources department was, for several decades, seen as a necessary cost for the smooth running of the organization. Nevertheless, and paraphrasing Peter Drucker, "what cannot be measured, cannot be managed", and the need arises to create impact and performance evaluation metrics to analyse in what sense the HR department is generating value to the organization, putting into perspective the structural cost adjacent to the department with the possible benefit it generates.

Therefore, Fitz-Enz (2010) states that no organization can continue its activity competitively based on indicators that are not quantifiable, developing research in order to introduce metrics in this area of the company, not only in order to evaluate the performance of the department itself, since this type of metrics already exist for several years, but with the aim of producing strategic value for the organization itself.

Deepening this theme of costs, Fitz-Enz and Mattox (2014) argue that, like any other activity in a company, there is a cost to attract, recruit, develop and retain talent in a cycle of human capital development, not only financial but also immaterial (time, resources, among others), as well as team-building activities, employer branding or even the storage of data for each employee. Later, if we intend to obtain information from this data and with this activity produce some approaches to actions to be taken in the organization, we will also have a cost, not only of the operation itself but also of the knowledge needed to do it. The question is: *How can we get a return on investment? How do we manage to transform the cost of the present into the benefit of the future?*

In fact, in any organization and in any area, managers seek return on their investment. Fitz-Enz and Mattox (2014) state that it is difficult to measure the return being generated on the investment, as the action triggered by HR can produce results in other areas of the company, and if there is not an integrated view of all the departments, the causality analysis becomes more complex. However, the authors are clear when they state that several investments made in this area do not have the desired return, and in large part the reason is the inefficiency of the operation.

In line with this perspective, Ashton et al. (2004) had already argued that to have a transition from the view of the department as a cost, it is necessary to look for other ways to create value for the organization, with greater accountability of the department in defining the objectives and the path to be followed because HR is a key part in designing the company's strategy. For this to happen, the authors indicate that there must be a framework between the company's final strategy and the HR department's objectives, and its organizational practices such as evaluation metrics must meet the business objectives, developing the organizational culture in the intended strategic sense, with technology being the facilitating agent in all these processes.

2.2 Measuring Human Capital to Optimize Decision-Making

According to a study developed by Fitz-Enz (2010), most companies do not have their HR department and its adjacent metrics linked to the business strategy, and only a fraction of them report their activity on a regular basis to top management. That said, one of the main reasons given for this phenomenon is because this type of reporting does not have a direct influence on the type of strategies adopted by the organization, nor does it promote a cause–effect relationship between the verified results and the resulting actions to be taken of those results.

Gibbons et al. (2009) had already analysed this issue, stating that despite all the metrics adjacent to the HR department and human capital management, decision-making was for a long time based on "instinct", rather than in facts. Despite this, they point out that new technologies make it possible to trace patterns of relationship between the intangibility of human capital and the tangibility of the business, starting a path that may place the area in a strategic pillar of any organization. The authors thus explore the concept of evidence-based human resources management, that is, evidence-based human resources management, which will serve as a support for HR Analytics to make its contribution to organizations in which the wealth of its human capital is essential.

Regarding specific measures, it is possible to state that they are context-dependent and that they vary over time according to the organization's needs. Baron (2011) indicates that there are four main areas where it is necessary to compile human capital assessment measures: (1) how talent is attracted, recruited and retained over time; (2) how talent is developed and used; (3) how talent is rewarded and motivated; (4) how knowledge and performance are managed in the organization. According to these four areas, the author goes deeper into some analysis possibilities. According to the author, it is necessary, first, to collect data for analysis, and then we can draw a human capital assessment model based on these measures, as explained in the following Table 1.

Based on this framework, the author indicates that the results of the framework are intrinsically linked to the value of human capital in an organization and that, depending on the organizational needs, it may be subject to transformations over time, to fit in with the business needs.

It should be noted that these types of strategies are based on Key Performance Indicators (KPIS), and that they depend on data collection. In this scenario, the way data is collected and the use given to it, may be a contributing factor to the creation of value within the organization. Fitz-Enz and Mattox (2014) list four levels of action that can be applied to analyse information regarding this issue. In a first phase, describe, later explain, followed by predicting and optimizing. This process starts with simple metrics and reports, later evolving to more complex analytical models, with the potential to create value as much greater as the evolution and complexity of the process.

Table 1 Impact of the value of human capital on organizational performance (Adapted from Baron, 2011)

Area	Evaluation factors
Acquisition and retention	Good profiles are successfully attracted
	The contracted resources meet the organization's standards
	The organization does not lack intellectual capital in its teams
	The organization demonstrates strategic planning on talent, including succession planning
	The organization can retain capabilities vital to the operation of its business
Development	Individuals demonstrate agility in dealing with different circumstances
	Human resources demonstrate acquisition of new knowledge and their application
Motivation and reward	Rewards are linked to the organization's success
	The organization manages to make the relationship between commitment, engagement and effort
Performance	The organization perceives the relationship between high employee engagement and business factors, such as customer retention
	The organization's ability to innovate

2.3 HR Analytics as a Strategic Partner of the Organization

According to Lawler and Levenson (2004), in most cases the human resources department did not seem to be making much progress in terms of becoming a strategic partner of organizations and this is often because not having the metrics and analytical models that are present in other areas such as finance and marketing, for example.

Despite this, the authors state that HR Analytics is changing this paradigm as it helps to clarify and quantify the impact of human resources practices on organizational performance and, in this sense, has the potential to create value throughout the structure, being able to influence strategies and business decisions. Thus, the authors state that for the human resources department to become a true strategic partner, it needs to present data and adjacent analysis to demonstrate that human capital management affects organizational performance and are not just a necessary cost for the smooth running of the organization. In this sense, the application of data analysis tools and statistical techniques that have the potential to identify patterns between human resource practices and indicators such as customer satisfaction or other business metrics, make HR Analytics increasingly an important strategic partner for the organization (Lawler & Levenson, 2004). The first type of metric we can take as a starting point is the effectiveness of human resources in administrative tasks. For example, average hiring time, headcount ratios and administrative cost per employee (Lawler & Levenson, 2004). The second type of metric relates to role efficiency.

Efficiency means that human resources practices and policies produce the desired effects on the target(s) they are aimed at.

Later, Lawler and Bordeau (2009) analysed in what concrete sense human resources become a strategic partner of the organizations and identified some strategic activities within the organizations that are positively related to the role of the human resources department in the strategy of the organizations and that could be an indicator of the evolution of the importance of this department in the strategic role of the company: (1) Identify or suggest new strategic options; (2) Decide on the best strategy to use; (3) Planning the implementation of the strategy; (4) Outline the organizational structure for implementing the strategy; (5) Identify new business opportunities; (6) Plan new merger, acquisition or divestment strategies (Lawler & Bordeau, 2009, p. 6).

It is important to highlight Castellano (2014), who states that although HR Analytics is often seen as a replacement for subjective human interpretation, it is more about a balance between quantitative information and naturally qualitative human judgment, not just about collect the information, but know how to use it based on techniques and procedures that meet the organization's strategy. Following the human importance in the discipline, Davenport et al. (2010) state that special attention should be given to the human side of human resources, and this analytical aspect cannot serve the purpose of dehumanizing employees, nor should they be treated solely and exclusively as resources.

3 Methodology

According to the Literature Review, there are some starting questions that become relevant in this problematic, making it essential to define them. The object of study, as mentioned, will be the technological companies in Portugal. Thus, based on the literature review and the problem under analysis, the following research questions were formulated to proceed with the analysis of the study objective and its contraposition with the literature analysed:

1. Is there an awareness among technology companies of what HR Analytics represents?
2. Is there a need in these types of companies for a tangible analysis of indicators within human resources departments?
3. What are the most relevant metrics for the department and the business?
4. Does this type of practice represent a competitive advantage for companies and assist the organization in meeting its business objectives?

For the purpose of the study, the companies were selected through a convenience sample. The first selection criterion was the Information Technology activity sector. The second selection criterion is related to the region, with the organizations having offices in the North of Portugal (not necessarily the headquarters, it could be a branch office). Thirdly, it was the public knowledge of some human resources practices

within organizations that are seen as industry benchmarks, with the chosen organizations appearing in several rankings of best companies to work for in Portugal. Finally, there are organizations that have practice with an analytical component regarding the functioning of human resources, with the objective being to analyse their level of maturity and in what sense this type of actions bring value to the business on a daily basis.

The business areas of organizations, although included in the Information Technology sector, are quite distinct. In the sample, it is possible to observe several areas of activity, from digital marketing, to consulting, telecommunications, retail, e-commerce or software houses. Despite the diversity of performance of each of the organizations, there is a point of contact that makes them similar: their human capital. Both are composed, in their majority, of collaborators in the technological area, from software engineers, systems, databases, digital business specialists, among others. As this is a highly competitive area in terms of human resources, where the demand for a qualified workforce often exceeds the supply, it is expected that human resource management practices and methodologies will be more developed compared to other more traditional industries, because there is a constant effort for organizations to be attractive to individuals in the sector. To maintain the privacy of the data under analysis, all companies will be kept anonymous during the investigation.

As previously mentioned, data collection was carried out through semi-structured interviews, which were later transcribed to maximize the information provided by the interlocutors and avoid losses. The analysis of the collected data was through content analysis, which allows a detailed and systematic study of the information, whose purpose is to discover and interpret its meaning.

Regarding the characterization of the interlocutors, of the five interviewees, four are female, with only one male. A large part of the interviewees already has vast experience in the sector (more than ten years), with only one of the interviewees having less than five years of activity. All of them hold management positions in the human resources area and assume responsibility for managing teams.

Regarding the characterization of the companies, it is important to mention that although they all have an office in the northern region of the country, only two have their headquarters in Porto, with two of them having their headquarters in Lisbon and one having its headquarters in London and the Portuguese branch located in Porto.

In terms of size, we have to highlight two large companies (Company 1 and Company 4), two medium-sized companies (Company 3 and Company 5) and a small company (Company 2). With the selection of this sample, we sought to have a broad spectrum of analysis, characterized by companies of different sizes, with different human resources practices and operating in different sectors of activity. The following Table 2 summarizes the selected sample.

All interviewees have at least a bachelor's degree and two of them have master's degrees and specializations, the speaker from Company 2 in the area of People Management and the speaker from Company 4 in the area of Business Analytics and Big Data.

Table 2 Sample characterization

Company	Interlocutor's position	Interlocutor's gender	Interlocutor's uptime	Interlocutor's academic qualifications	Company's sector of activity	Headquarters' location	Company size
Company 1	Unit manager	Female	3 years	Degree (Criminology)	Information systems consulting	Lisbon	~500 employees
Company 2	HR manager	Female	5 years	Master's degree (Psychology), postgraduation in people management	Information technology for digital marketing	Porto	~50 employees
Company 3	HR manager	Female	14 years	Degree (Human Resources)	Retail information technology	London	~150 employees
Company 4	People analytics project leader	Male	10 years	Master's degree (Business Management), specialization in business analytics	Telecommunications	Lisbon	>2500 employees
Company 5	HR manager	Female	15 years	Degree (Human Resources)	Software house	Porto	~80 employees

4 Analysis and Discussion of Results

Based on the study objectives that are defined, firstly, by exploring the study of KPIS analysis in human resources in companies in this sector and, secondly, by understanding whether there is an implemented HR Analytics strategy, exploring its level of maturity and knowing its specificities, some key themes were categorized to allow the analysis and discussion of results:

- Use of KPIS in Human Resources;
- Applicability of KPIS and Reports Made;
- Definition and Relevance of HR Analytics;
- Decision-Making in Human Resources;
- Contextualization of the Information Technology Sector.

4.1 Use of KPIS in Human Resources

The use of Indicators is important in HR Analytics as it serves as a foundation for the development of analytical models that can provide answers to business problems, not only from a HR perspective but also in a holistic view of the entire organization. On this topic, Fitz-Enz (2010) states that quantifiable indicators are important not only to evaluate the performance of the department itself but also to produce strategic value for the entire organization.

As you can see, of the five companies that were interviewed, four perform KPIS analysis and compile them into reports for analysis. As mentioned by the interlocutor of C2, the "*human resources processes with regard to indicators are not clearly structured*", and "*the management of resources depends on the needs of the moment"*. This factor was justified by the company's interlocutor based on its small size and low turnover rate for the sector, so the ad hoc analysis is efficient in its case.

About the others, the importance of analysing indicators in Human Resources was highlighted, especially with regard to issues such as recruitment and turnover. This factor is particularly reinforced by C1, which, this factor is particularly reinforced by C1, which, as a consultancy operating in the technology area and whose business volume is based on Outsourcing skilled labour in information systems, has in its human capital its source of business and that recognizes as essential to have the recruitment and retention areas totally under control. As mentioned by the interlocutor, "(…) *we are a company that works with several clients in the consultancy area and, therefore, unlike most companies, we do not sell any product, we "rent" knowledge. This knowledge comes from our human resources, consultants, and therefore it is essential for us to keep track* (…)*"*.

Also, C3 and C5, software houses that develop products and provide technical and functional consulting on the products they sell, place special emphasis on these two factors, and C3 has in place a quarterly SWOT analysis with several indicators, which include the indicators mentioned above. Performance evaluation is also a

factor mentioned by this company as being important because it promotes the career development of its employees, which in turn can maximize their retention.

With regard to C4, it is possible to state that there is an analytical model with maturity in force and that allows KPIS analysis at different scales, being adaptable to teams, projects, and different areas. According to the interlocutor, the "(…) *importance of these is defined by the business objectives, on the one hand, and the characteristics of the workforce, on the other hand* (…)", *giving a concrete example: "(…) in a call-centre company, some of the main metrics will be related to the exit of employees and their replacement cost, given the turnover rate of the sector (…)".*

4.2 Applicability of KPIS and Reports Made

The concern of the respective companies with recruitment, retention and career development plans for their employees is evident. In an area where the shortage of qualified human resources is a reality all over Europe, companies are faced every day with the competitiveness of the market not only in their area of expertise but also for their own human resources.

Regarding other factors mentioned, it is worth noting the answer of Company 1, which refers to the number of interviews conducted as an analysis factor in the organization, stating that regarding the reports, *"(…) on the one hand, the recruitment productivity of human resources, for example, how many interviews you do per week, how many interviews are necessary to make a hiring (…) and on the other hand, we have the monitoring and retention reports of employees."*. In this sense, we can identify two levels of analysis: on the one hand, the analysis of indicators that refer to the employee, but, on the other hand, the analysis of indicators confined exclusively to HR productivity. Considering the sector in which this company operates (outsourcing in the technology area) it is natural that this is an extremely relevant topic, as recruiting and retaining is its core business.

Company 3 also presents a systematic structure for the analysis of these indicators, where the interlocutor stated that *"(…) we have KPIS that is part of our ISO-9001, it is one of the points we take into account and they focus on Turnover, satisfaction survey, as well as the training area (…)"*, referring also to a *"(…) quarterly SWOT analysis with the assessment of risks, opportunities, strengths and weaknesses associated with each area (…)"* and a *"(…) annual performance evaluation with quarterly feedback (…)"*.

Company 4 presents a symbiosis between top management and HR in what refers to the implemented action plan, stating that *"(…) within the scope of the strategic plan, a set of HR strategic levers is defined, which translate into an HR action plan, with the most relevant human capital initiatives for the company (…)"*.

When it comes to the type of action inherent to the development and analysis of these reports, the answers are quite enlightening: all companies intend to implement continuous improvements to their processes. As stated by Company 3, *"(…) if the KPI is not being achieved as we want, an action strategy must be developed together*

with the team leader to improve the indicator (…)", and Company 4 goes deeper into this issue, stating that *"(…) it is the follow-up, and the respective reflection on the results, that allows the generation of insights on which to base actionable recommendations for improvement and/or experimentation (…)"*. With regard to companies 1 and 5, both mentioned that these reports intend to trigger an implicit action and improvements in processes, but the response was not accompanied by examples.

Regarding the responsibility for these actions, Companies 1, 3 and 5 expressed a joint responsibility between HR and the first line managers of each team. It turns out that although the process would be triggered in the first instance and with primary responsibility by the HR manager, this process would ultimately be shared with the first-line manager, who has the most contact with the employee. As mentioned by the interlocutor of Company 3, *"(…) HR Manager is responsible for the KPIS and responsible for the action process resulting from its analysis, and in many situations the objective is to work together with the team-leaders.*

Regarding Company 4, given the more mature structure in the analytical aspect in HR, it is said that the *"(…) activity is the responsibility of the people analytics team, in HR, who work on the recommendations with a multidisciplinary team (…)"*, with an entirely dedicated team to do the analysis and recommendation based on the analytical models developed.

- **Definition and Relevance of HR Analytics**

Analysing the level of HR Analytics implementation in these organizations, we can see that the results are in line with what has been observed so far. All companies, with the exception of C2, have some type of analytics system that supports decision-making, although a large portion of them are at the first level, where they cement points such as decision and workforce optimization, and gathering information about possible decisions and their outcomes (Fitz-Enz & Mattox, 2014).

In this sense, the interlocutor of C1 refers that it is something that is in progress, *"(…) even in the sense of evaluating our productivity over time (…)"*, something that is in line with the previous answers from this company, which reveals an analysis more focused on the department itself than on the entire organization in a holistic way. C3 mentions that it is carried out *"(…) a KPIS analysis and as a result of this analysis we take actions (…)"*, something that fully meets a descriptive analysis. In the same line of implementation follows C5, which states that *"(…) we have implemented KPIS analysis (…)"*. In a different paradigm is C4, which states that the *"(…) company began designing an HR analytics ecosystem in 2015, which has allowed analytics to evolve from descriptive to predictive and prescriptive (…)"*.

Regarding the type of added value created within the organization because of the implementation, C1 refers to the importance of market competitiveness, stating that *"(…) we became competitive in the market and managed to be sustainable over time (…)"*, a natural concern of those in the business for their ability to recruit and retain talent. C2, despite not having implemented it, recognizes a potential for added value when we add this analysis to a larger organization, saying that there could be *"(…) potential to create added value in an organization, especially in a larger organization*

and where KPIS analysis is central to the company's success (…)". C3 also claims that it is something that promotes the development of the organization's culture and performance, as it allows *"(…) we understand the requirements, how the functions are developed, the career development of our employees, ultimately leading to the retention of our talents, something very important in this area (…)"*. C4 states that naturally the *"(…) impact that HR Analytics can have on the organization is directly correlated with the analytical maturity of HR analytics practices (…)"* and that *"(…) the various stages of maturity, and the respective analytical capacity, always bring value, as long as it is involved in an analytical process of generating methodical insights and based on the right questions, in view of the "problems" to be solved. (…)"*, stating that there are problems for all types of analyses, from the simplest to the most complex. In turn, C5's answer goes in the direction of C3, stating that this process *"(…) allows to implement continuous improvement plans and maintain process control (…)"*.

4.3 Decision-Making in Human Resources

There is a pattern regarding the symbiosis between the HR department and top management. All interlocutors share information with top management, to promote the continuous improvement described in previous topics, although in some cases it is not clear what the degree of influence in decision-making after the transmission of information is. C1 states that the information shared goes towards recruitment and selection, going in line with the previous topics. C2, C3 and C5 go in the same direction, stating that there is sharing of information with the aim of promoting organizational performance. C5 states that they are communicated *"(…) factors and patterns that indicate an increase in the turnover rate, in order to keep it as low as possible, collect periodic and integrated feedback to see if there is something that may not be meeting expectations (…)"*.

With regard to C4, this sharing of information is also mentioned by the interlocutor, and he mentioned three examples of information that can be transmitted to top management, considering its increasing degree of complexity. The interlocutor starts by mentioning that *"(…) in a scenario of increasing turnover, with impact on the business, it is possible, if based on pattern analysis to identify the potential causes, to design metrics that allow to evaluate the evolution of meritocratic practices in the organization and related to the evolution of departures (…)"* this scenario being confined to a descriptive analysis. On the other hand, *"(…) at a more advanced stage, it is possible, through advanced analytics and machine learning, to build models that identify the risk level of voluntary departure per employee (…)"*, this being a predictive analytics scenario. Finally, analytical models based on recommendation systems are highlighted, where the interlocutor refers *"(…) causal inference analysis that assess the impact of retention actions taken in the past, so that recommendations are more accurate (…)"* this being a predictive analytics scenario.

With regard to the second question of this topic, it has been sought to understand how HR decision-making is structured in each of these companies. In this question, some differences were observed regarding the way in which each of them works. C1 mentions that there are *"(…) every week KPIS review meetings, where we define action points for the immediate (…)"*, having an agile mode of action with immediate response, revealing once again the need to implement actions quickly and flexibly. C2 mentions that *"(…) decision making depends on the need of the moment. (…)"* which is also in line with what has been observed so far, with processes structured in an agile manner, not having a previously defined strategic plan exclusively for HR, with decisions being taken according to immediate needs. C3 mentions that it is carried out *"(…) a quarterly SWOT analysis with the assessment of risks, opportunities, strengths and weaknesses associated with each area (…)"* and also *"(…) entrance and exit interviews, satisfaction survey, quarterly 1vs1, annual performance evaluation with quarterly feedback (…)"*, having a solid process for decision-making, based on various events that take place over time. C5 states that *"(…) the process is circular and constantly changing, with the ultimate goal of improving the employee's experience (…)"*, also revealing flexibility and little rigidity in the processes, going against what was observed on C1 and C2.

In turn, C4, which is based on its consolidated and mature analytical model, has a well-defined process for decision-making, which starts with a *"(…) reflection on the most pertinent business issues, which involves clarifying the problem/situation and how it should be addressed (…)*", then there is the *"(…) hypothesis construction (…)"* that is followed by the *"(…) data collection and determine the quality of the data, and clean up if necessary (…)"*. Afterwards, it takes place the *"(…) the analyses that test the hypotheses and provide the basis for generating insights (…)",* that follow up on *"(…) actionable recommendations (…)"*. There is an interesting point mentioned by the interlocutor, which is based on HR's ability to present and argue in order to form a convincing narrative, the ability to story-telling. The interlocutor states that *"(…) It's especially important to ensure that we influence the decision, so it's critical to communicate insights and recommendations in a convincing, visually strong, compelling narrative, supported by data. (…)"*. Finally, there is a duty to *"(…) ensure the implementation and monitoring of the recommended actions, evaluating the success of the project based on a set of metrics that return value to the organization (…)"*.

4.4 Contextualization of the Information Technology Sector

With regard to the question of comparing the information technology sector with other sectors, the answers are, for the most part, in the same direction. C1 states that there is greater sophistication in HR practices, and it is unavoidable that competitiveness in the sector brings more demands for HR. The interlocutor says that it is normal that *"(…) human resources management in this sector is more subject to innovation due to market competitiveness (…)"* and adds that *"(…) It is important*

that companies remain competitive, have employer branding strategies and career plans for their employees (…)". The answer from C2's interlocutor also goes in this direction, stating that it is a sector more conducive to innovation and flexibility at work. Thus, the interlocutor claims that *"(…) this sector is more favourable to innovation than any other (…)"*, being that *"(…) the technological area is unique in terms of organizational practices and culture (…)"* and that *"(…) the work environment is flexible and different from other more primary industries (…)"*. This point raised by C2's interlocutor regarding "primary industries" is interesting, as C3's interlocutor has worked for several years in the secondary sector (civil construction) and precisely raises this issue, stating that it is a more complex sector, with greater competitiveness and that makes more demands for HR. He also added that the fact that it is an area in constant mutation and evolution, requires that HR is in continuous learning. The interlocutor claims that *"(…) the type of profile in the technology area is more complex, even in the recruitment area (…)"* and that this *"(…) is a constantly changing area and it is essential that we are constantly learning (…)"*. Unfortunately, we were unable to get the answer from C4's interlocutor regarding this issue since it was at the end and had to be abbreviated with some parts of the interview as the interlocutor had a meeting right away. Finally, regarding C5, the opinion is in line with most of the answers given, mainly in line with C1, stating that it is an area where there is greater evolution as the market is more competitive. The interlocutor claims that the *"(…) The technological sector is quite evolved in terms of its practices compared to other sectors (…)"*.

Regarding the question that analysis the objectivity of HR and whether the quantitative factor is having an increase in importance relative to the qualitative one, here the answers are unanimous, with the exception of C4. All refer that the human factor is essential, despite recognizing that the KPIS can provide some assistance in terms of decision-making. In this matter, it is worth highlighting the response from C3 that states that *"(…) the human and qualitative factor is always the most important, we are talking about people and not machines that are predictable (…)"*, adding that *"(…) however, quantitatively we were able to measure and optimize some processes that are related to employees (…)"*. Unlike this stream, C4's interlocutor states that KPIS are essential in decision-making. The interlocutor even said, during the interview that, *"(…) what we cannot measure, we cannot manage (…)"* and that the indicators will allow *"(…) read with much greater reliability, in a holistic and integrated manner, the impact of human capital management practices on the organization's performance (…)"*. This factor can be verified given that, as noted, this is the only company that has a complex and mature analytical model, performing descriptive, predictive and even prescriptive analysis, according to the pyramid for value creation in HR Analytics by Fitz-Enz and Mattox (2014). All the other interlocutors of the other companies carry out descriptive analysis and for this reason it is possible that they do not place as much confidence and importance in these models as the interlocutor of C4.

5 Conclusions

This study was developed to analyse the quantitative and analytical aspects of human resources in the technological sector in Portugal and to understand their degree of maturity, practical applicability and generation of added value for their organizations. This is an exploratory descriptive study in which semi-structured interviews were used as a technique for collecting data from some companies in the area of information technologies. The transcription of the interviews and their subsequent categorization and coding facilitated the analysis and standardization of data, and for this purpose content analysis was used as a data analysis technique.

It is important, first, to resume the objectives of the same to clarify the results obtained:

- Check if there is an awareness of technological companies for what HR Analytics/People Analytics represents and its relationship with HR indicators;
- Check the importance given to these practices in relation to the Strategic Management of Human Resources;
- Check whether there is a need in these types of companies for a tangible analysis of indicators within HR departments;
- Check if there is a symbiosis between the analysis of human resources indicators and the organization as a whole;
- Which metrics are most relevant to the department and the business;
- Check whether this type of practice represents a competitive advantage for companies and helps the organization to fulfil its business goals;
- Get the interlocutor's view on what the future trends will be.

The results indicate that there really is an awareness of technology companies for what HR Analytics represents and what is in its genesis. All companies demonstrated that they are aware of the trend and realize the benefits it can bring to the organization. Most of the interviewed companies apply descriptive analysis of their human resources indicators, something that, according to the literature, is the first step towards the analytical integration of the department with the entire organization. In line with the authors Fitz-Enz and Mattox (2014), it appears that a large part of the analysis aim to assess the productivity of the department itself, rather than generating added value for the organization in a holistic way. This type of procedure is not recent, and as presented by Dulebohn and Johnson (2013), efficiency metrics such as cost per hire and yield rates, or human capital metrics such as costs and income per FTE, are analysed for several years from a SHRM point of view and allow you to assess the performance and productivity of each organization's HR. However, it is necessary to make an abstraction between this type of metrics and effectiveness metrics such as ratio analysis (such as average salary) and comparison with the competition, the progression of employees through development plans and in the last level the strategic impact metrics, which relate the various metrics, tools and methodologies applied in HR to the results of the entire organization. The difference between these four levels is clear: while the first ones are centred on the department itself, the last

two focus on the organization as a whole and even on the competition itself. With the exception of one company (C4), it appears that most of the companies interviewed are found more in the first two levels than in the last two. It is important to highlight in this topic the challenge from an organizational point of view of transforming a cost (internal investment) into a profit, even in the medium term, and given that the implementation of an analytical model of the character of C4 in an organization has costs for the structure, this is a difficulty this department goes through as it becomes difficult to measure the return on investment made, as an action triggered by HR can produce results in several other areas of the company, and without this holistic view, it becomes difficult to assess the causal relationship between the two (Fitz-Enz & Mattox, 2014).

Having made this premise, it is important to point out that, according to the analysis carried out, there is a path that is being traced despite the previous observation. According to the evolution of HR KPIS presented by Ulrich and Dulebohn (2015), we can divide them into three levels: in a first phase, the human resources practices, which seek to measure the department's professionals and their performance. In a second phase, the intermediate results, where the objective is to measure the results originated from human resources practices, such as the organization's culture and the development of talent and, finally, in a third phase, it seeks to measure the organization's results, measuring the results in an integrated way with other departments. Thus, the analysis carried out shows that most of the companies studied in a second phase are framed, in which a real concern with the career development of employees, the company culture and the "emotional" salary was observed, something that was quite manifested including by C3. Thus, it is possible to state that the sector's competition is bringing benefits to its workforce, as there is an increasing concern on the part of companies with the well-being of their employees, as mentioned by C3 *"(…) we are talking about an area with an above average remuneration, and many times people work not only for the money, but also for their well-being. (…) it's called emotional salary (…)"*. Thus, it is possible to state that in most cases the first barrier was eliminated, which "closes" the HR department on itself, and that in most cases, especially in this area, HR is a true strategic partner of organizations, going against the evolution of Lawler's studies (2012).

With regard to the companies' need for the analysis of indicators, it was quite clear that, once a certain dimension is reached, indicators are important for the good functioning of the organization. It is even possible to clearly identify which are the most important indicators from a strategic point of view, according to the analysed sample, being centred on the talent itself, be it recruitment, retention or its development. This observation is perfectly normal based on the data presented and the continued shortage of labour, and was even more notorious at C1, in which its business involves recruiting, motivating, developing and retaining talent, which demonstrated a clear inclination towards this aspect, being the only one of the companies that demonstrated to have recruitment/retention objectives and metrics as a basis for performance analysis of the HR department itself.

Making a parallel with the competitive advantage obtained from the coherent analysis of indicators, it is also possible to say that companies recognize that there

is a competitive advantage created from their analysis, and a large part of them even claim that only in this way they manage to maintain competitive in this market. Only one of the companies (C2) did not identify a competitive advantage in its specific case but stated that it recognizes that it can bring added value in a larger company where large amounts of data are generated that can be transformed into information, which is not your case because it is a small start-up.

With regard to the importance given specifically to KPIS in an analytical aspect, the perception of it is diffuse. It is true that a large part of the companies interviewed in the sample apply descriptive analysis to assist in their decision-making, but it is uncertain what importance they attribute to these indicators when making the decision. When asked about this issue, most respondents clearly demonstrated that the human factor is essential in decision-making. This factor alone demonstrates that HR (of the companies included in the sample) is farther from moving towards becoming a more quantitative and data-based science, a path that the marketing area has been following for a long time. Nevertheless, it was interesting to observe the parallelism that C4's interlocutor drew from the People Analytics strategy applied in his organization with marketing, demonstrating that this type of practice exists with models matured in our country, with this organization having been distinguished by Gartner in 2018 due to the People Analytics project they have under development. This level of maturity allowed this company to develop three analytical modules in its HR department. On the one hand, workforce analytics, which is essentially based on workforce planning, HR Analytics that ensures full coverage of human capital management through more than 200 KPIS, and the People Analytics module, which seeks to be an evolution of last and carry out a recommendation and continuous improvement analysis on your HR Analytics indicators.

Regarding the symbiosis of HR with the other departments of the organization, it was observed that this is a reality, especially with first-line managers, team leaders or team leaders. It was found that all HR departments work closely with this middle management line to provide a faster, more agile and effective response. The companies even demonstrated that they have career development plans or performance appraisals that have shared responsibility between HR and team leaders. In the specific case of C1, a follow-up plan was listed with formal quarterly meetings to obtain feedback and implement improvements, in which they are interspersed between HR and team leaders. As for the symbiosis from a strategic point of view with top management, it was not clear the involvement of some HR departments in this situation. It was possible to verify that both C3 and specially C4, have strategic involvement with top management to share information and recommendations, but regarding the others, this is not something that can be assured.

Finally, regarding future trends in the sector, there is a growing concern with the well-being of employees, and the balance of professional life in a component of personal well-being, with a series of factors in development that aim to promote this objective, such as the exploration of new forms of work, greater flexibility in working conditions and greater automation and digitalization of processes. We are witnessing today, not for the best of reasons, an acceleration of this transformation, brought about by the pandemic crisis that has ravaged the world. Several companies such as

Facebook, Twitter, Shopify, Squarespace, Dropbox or Slack have already announced that flexible working, which includes telecommuting, will remain in place permanently, even after the pandemic is over. According to a study developed by Gartner, about eight out of ten companies revealed that they intend to allow teleworking, at least in a hybrid and occasional way, and 47% of them showed that they intend to allow their employees to have access to remote work whenever they want. This paradigm shift that we are experiencing makes the integration of our work life with personal life, the work–life balance, to have a drastic change that can actually change the world of work as we know it today (Gartner, 2020).

It is expected that this study has contributed to the creation of new perspectives and value generation regarding the implementation of HR Analytics and that it has provided a broad view of the concept, as well as the deepening of data-driven management in HR. As referenced in the literature review (Cravino, 2010; Fitz-Enz, 2010; Fitz-Enz & Mattox, 2014; Lawler, 2012; Lawler & Levenson, 2004), it appears that this is an area that is in its initial phase and that the implementation of an analytical model with contributions from various parts of the organization, especially information technologies, is something that is not an established standard today if we have the observed sample as a starting point, and only CE4 complies perfectly with these requirements.

Regarding the limitations based on the results obtained, it is possible to state from the outset that one of the limitations of the study is related to the low number of participations, and that, in fact, a sample of five companies is not sufficient to establish generalized conclusions about the sector. Based on the exploratory nature of the study, the objective was more focused on getting to know these realities as exhaustively as possible, rather than drawing generalized conclusions. It is also important to state that not all interlocutors had the same level of knowledge about the topic, which can also generate a discrepancy in terms of the quality of the information provided. Finally, it is essential to refer to the historical moment we are experiencing, caused by a pandemic, which brought structural challenges across the board in all sectors of our society and which, therefore, brought an added difficulty to this investigation.

Regarding future recommendations, it is possible to say that the research in HR Analytics is still limited and further development is needed, so the recommendations are not very diverse. One of the possibilities for the future would be to focus on organizations from other sectors in order to weave a comparative analysis between them. Another possible path to follow would be to carry out a more in-depth study of organizations that have advanced analytical models in place, such as C4, realizing how this strategy is structured and implemented in practice. Also in this sense, it would also be interesting to assess how the HR departments themselves are organized in order to have this very distinct practice within the department itself, seeking to know what the teams' skills, their multidisciplinarity and complementarity.

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