

Digital transformation, IoT and 5G network regulations

Opportunities for digital marketing and sustainable business development

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Abstract

The tremendous disruptive potential of novel sophisticated technologies is likely to have triggered the fourth industrial revolution – the so-called “Industry 4.0” – capable of transforming worldwide and EU industries, undoubtedly, with a significant social, economic and environmental impact. The gradual handover of independent choices to cyber-physical systems and machines, entailing the self-sufficient generation and use of actionable information, will shape the information-driven metamorphosis of manufacturing and of other activity areas in a networked environment of individuals, data, processes, services, systems and IoT-enabled industrial devices.

By relentlessly exchanging information with each other and being capable of learning – particularly when empowered by AI systems, IoT devices allow not only environmentally friendly real-time optimised production processes and the more efficient planning of activities, but offer also wide-ranging opportunities for the implementation of digital marketing instruments, thus, facilitating improved responses to individual consumer requirements.

Digital transformation – having the future 5G network standard as its underlying technology – poses significant economic and legal challenges for traditional businesses, especially, with the introduction of virtualized IT processes relying on Network Functions Virtualization (NFV), Software-Defined Networking (SDN), and cloud platforms for “as-a-service” solutions. In all aspects of sustainable business innovation, the legal requirements play a vital role, having substantial impact on the development of communication technology standards and influencing major sustainability topics such as collaboration in the supply chain or protection of privacy and safeguarding intellectual property.

Therefore, understanding the connections between sustainability issues, innovative technologies and the law will represent the key to unlocking the opportunities of digital transformation.

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1. Introduction

Digital Transformation is one of the most difficult challenges, that organisations in general and businesses in particular have to face in the current dynamic global environment. The most prominent enabler of the so-called “Industry 4.0” is the new 5G Network standard which will cater to the multifarious requirements of the IoT based economy. However, 5G is not merely a new type of technical equipment, but more a new “philosophy” which illustrates the fundamental paradigm- shift in network design and management that allows the flexible and rapid adjustment of electronic communications resources to novel business models and social interactions.

The 5G model is built around the concepts of Network Functions Virtualization (NFV) and of Software-Defined Networking (SDN), that separate the “logical” plane from the “physical” plane of the network architecture, thus making possible to use generic equipment for building the network infrastructure and permitting a supple and rapid network deployment and superior system scalability.

An essential 5G design approach has been to take advantage of existing technology investments in the precursor LTE-standard while bringing into play new spectrum and new technology capabilities. The flexible, innovative and more efficient use of radiofrequency spectrum – the radio frequency (RF) portion of the electromagnetic spectrum – poses significant difficulties for both regulatory agencies (that administer spectrum resources) and technology businesses or other stakeholders. Therefore, the following two sections will provide an overview of the main digital transformation developments and 5G economic, technological, and regulatory issues.

2. Digital Transformation: Opportunities for Digital Marketing and Sustainable Business Development

As Teigland and colleagues [1] point out, tech-centred enterprises (with their “asset light operations”) are progressively in the main focus, eroding the position of conventional “asset heavy companies”: “Since the year 2000, digitalization’s influence on products, services, processes, and business models is the primary reason that just over half of the names of the companies on the Fortune 500 list have disappeared. [...] For example, in terms of market capitalisation Microsoft was the only technology company among the top five publicly traded firms in 2000: GE, Citibank, Walmart, Exxon and Microsoft. By 2016, however, all five were technology companies: Apple, Alphabet, Microsoft, Amazon, and Facebook. Turning to the S&P 500, the percentage of tangible assets in these companies’ valuation from 1975 to 2015 fell from 83% of the total value to 13% with the value of intangible assets, rising from 17% to 87%.” [1] This is also a major concern for the EU institutions and businesses from the perspective of sustainable economic development, as sophisticated technologies are presently thrusting forward **Industry 4.0** (the “fourth industrial revolution”) – representing a massive growth potential for the EU, while having a substantial social, economic and environmental impact through the need of conversion of current European industries and enterprises.

According to the EU SPF 2016 Report on Digital Entrepreneurship, “Europe has a leading position in many manufacturing sectors from automotive to pharmaceuticals, or mechanical engineering, but also in many service sectors such as the tourism and leisure industries. Three quarters of the value of the digital economy will come from traditional businesses. It is thus essential to support their transformation for Europe to keep its leading position. [...] Disruptive business models and improved production processes, empowered by digital investments, will generate new international market opportunities”. [2]

The report emphasises the need of the EU to focus on four areas: **cities and regions as launch pads for digital transformation** (because “they bring together local resources and facilitate collaboration between academia, industry and policy makers, fostering a modern, competitive, resource-efficient and sustainable economy”); **digital platforms and big data** (as the vast volumes of data produced through equipment and machines offer substantial prospects to “develop new business models, improve products and services, as well as bring about considerable economic and social benefits”); **reskilling the workforce with digital skills for industry** (since “digitalisation is making many manual jobs obsolete, while creating demand for new types of skills”); and the **development of a toolkit for decision makers to become ambassadors for digital transformation** (because “policy makers have to understand the social and economic implications of the digital age and how they change the regulatory framework to plan their actions and take full advantage of new opportunities”). [2]

Although the classic Schumpeterian economic mechanism is susceptible of reconfiguration and change because Schumpeter’s 1942 metaphor of “**creative destruction**” (which indicates the process whereby the formation of a new industry or method of doing things extinguishes the industry or process that preceded it) is rooted in the role accredited to the entrepreneur and his or her innovation, it is uncertain how this process will unfold across industries as digitalization advances. As Teigland and colleagues [1] stress: “Under the Sharing Economy umbrella [...] neither the industries nor their processes have been ‘destroyed’ by the advent of sharing.

Rather, traditional goods and services have been augmented through an interconnected array of digital services, such as social networks, location services, online payments, and rating systems. Such novel elements bring greater benefit to consumers, which often leads to the destruction of old practices, yet this will not necessarily lead to the destruction of old products and services". [1] The 2018 McKinsey report "Digital reinvention: Unlocking the 'how'" [3] acknowledges, that although for a significant number of businesses the discussion about "whether to pursue a digital transformation has ended in favour of profound change", companies which are unenthusiastic to digitize struggle to remain competitive. As time is running out, the central problem of top- management is "how to make the digital transformation happen before it's too late". From a **digital marketing perspective**, the present digitalization process empowers marketing professionals to comprehend their digital customers better than ever before, transforming the regular customer into a continuous generator of both conventional, structured, transactional data as well as more modern-day, unstructured, behavioural data. With **Big Data** as the new capital in today's hyper-competitive socio-economic arena, marketing decision making is drastically altered by the three dimensions specific to Big Data, known as the three Vs: **volume** (the extent of the data created), **velocity** (the persistent speed at which data are constantly produced), and **variety** (the varied abundance of data). Although the majority of marketers consider that these Big Data will contribute to the accomplishment of commercial objectives, researchers like Evrelles, Fukawa and Swayne (2016) [4] regard the process of transforming Big Data into a **sustainable competitive advantage** as difficult and complex: "Despite the significant potential of Big Data in transforming marketing activities, more than half of Big Data projects are unable to achieve their goals [...], highlighting major challenges for marketers". [4]

Therefore, we can conclude, that the sole decision to finance digital endeavours is not sufficient, because certain digital undertakings generate appealing returns, others don't. Consequently, companies must focus their efforts and investments prudently, thus calling for CEOs "to make tough decisions about how to transform their companies" and "to lead the transformation while other C-suite executives manage day-to-day efforts". [3]

3. IoT and 5G Networks: Use Cases and Regulations

There is a close connection between IoT and future 5G networks, as new technology generations are intricately linked with the use-cases envisaged by the public organizations and businesses. In this respect, the CERRE 2017 report [5] postulates that a novel generation of mobile communications technology is introduced in an interval of approximative 10 years, with the analogue 1G in 1981 and the latest advanced digital iteration, 4G, introduced in 2009. Thus, the new 5G networks are expected to be commercially implemented in early 2020.

The report further accentuates that: "Each new generation represents a complex interplay between interdependent stakeholders, including infrastructure equipment manufacturers, device makers, operators, and end-users, as well as regulators and policy makers at national, regional and global level. The interplay concerns the allocation and assignment of new radio frequency bands, the development of a new standard, the development of new network equipment, the investment in new infrastructure build-out, the launch of new devices and the uptake by end- users. This is a high- stakes game requiring deep investments which can only be successful if well-coordinated, and when supply and demand can be aligned". [5]

On the other hand, the mobile device market is already approaching maturity – being closely linked to the number of persons using those devices and, therefore, limited by population.

Consequently, innovators are focussing on IoT, which already covers a wide selection of applications. In this respect, business analysts like Rysavy Research consider that improvements to LTE, followed by the new 5G networks' abilities to support IoT, "will connect wearable computers, sensors, and other devices, leading to better health, economic gains, and other advantages". In this way, the new 5G standard "addresses not only IoT deployments on a huge scale but also enables applications that depend on ultra-reliable and low-latency communications, sometimes called 'mission-critical applications', that were previously impossible". [6]

The ITU 2018 report on 5G [7] also recognises the tremendous impact of the high speeds and low latency pledged by 5G which "will propel societies into a new age of smart cities and the Internet of Things (IoT)".

From a regulatory and economic perspective, ITU considers 5G as "an opportunity for policy-makers to empower citizens and businesses" – with 5G having a paramount responsibility in "supporting governments and policy-makers in transforming their cities into smart cities, allowing citizens and communities to realize and participate in the socio-economic benefits delivered by an advanced, data-intensive, digital economy". [7]

ITU also classifies the potential use cases for 5G networks in three major categories (see Fig.1):

1. **Enhanced mobile broadband (eMBB)** – enhanced indoor and outdoor broadband, enterprise collaboration, augmented and virtual reality.
2. **Massive machine-type communications (mMTC)** – IoT, asset tracking, smart agriculture, smart cities, energy monitoring, smart home, remote monitoring.
3. **Ultra-reliable and low-latency communications (URLLC)** – autonomous vehicles, smart grids, remote patient monitoring and telehealth, industrial automation". [7]

4. Conclusions

In the near future – if appropriately designed, regulated and implemented – 5G systems will enhance electronic communication services into novel application areas, called **vertical domains**, far beyond mobile voice telephony, mobile broadband access, and massive machine-type communication. As also ITU considers, "an overhaul of the regulatory, government and local authority approach to digital policy is needed to boost the roll-out of 5G networks" by "ensuring affordable access to public assets thereby strengthening the commercial case to invest in small cell infrastructure and 5G spectrum". [7]

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