

Gisca, Oxana; Matinmikko-Blue, Marja; Ahokangas, Petri; Yrjölä, Seppo; Gordon, Jillian

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Legitimacy challenges of local private 5G and beyond networks in Europe

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Authors:

Oxana GISCA

Early-stage Researcher,
University of Oulu

Marja MATINMIKKO-BLUE

Research Director, Center for Wireless Communications,
Adjunct Professor, University of Oulu

Petri AHOKANGAS

Professor of Future Digital Business

Adjunct Professor at University of Vaasa Finland & Aalborg University, Denmark

Seppo YRJÖLÄ

Professor of Practice, University of Oulu

Principal Engineer, Nokia

Jillian GORDON

Senior Lecturer,

Adam Smith Business School, Glasgow University, UK

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Abstract

Local 5G networks are on the agenda of public and private stakeholders, businesses, and policymakers. These local mobile communication networks can be deployed by different stakeholders to serve a variety of user groups with dexterous needs. Private networks serve closed user groups and have particularly attracted attention in many industrial use cases. The development and emergence of the local 5G and beyond networks depend on underlying regulations and implementation of the EU legal framework that varies between countries. The legal framework influencing local 5G network deployments and operations, which we here call the EU Digital Legal Framework, has been recently developed and some adopted by the EU, creating legitimacy challenges for local 5G and beyond network businesses. This influences especially deployments that are independent of mobile network operators (MNOs), impacting stakeholders' ability to become accepted and legitimate members of the mobile ecosystem. This paper identifies the relevant EU legal acts and presents the EU legal initiatives and a review of previous research from the perspective of legitimacy challenges of local private 5G and beyond networks. The study reveals the legal framework and pertinent elements to local 5G and beyond networks in Europe and the regulatory conditions under which new business models for local 5G and beyond networks may emerge. The analysis reviews the most recent legal acts relevant for the digital ecosystem and it adds to a better understanding of how regulation currently delimits the emerging business models of the local 5G and beyond networks. Finally, the paper highlights specific legitimacy challenges such as the lack of provisions for network architecture and tailored vertical-specific provisions on managing and ensuring the confidentiality of data that may hamper the security and data privacy; absence of related legal provisions on spectrum design that currently are formed for wide-area mobile network operator networks; limited infrastructure planning and highly competitive approach between a private and public sector that cause challenges for access and infrastructure; absence of update of market analysis that may jeopardize the competition for local 5G and beyond networks. Moreover, it proposes future considerations to develop and promote a vision of local 5G and beyond networks, share best practices and tailored implementation mechanisms, develop bylaws and promote a harmonized approach in their implementation between the member countries, and promote social and ethical values by developing government support policies and apply a risk orientated approach regulatory intervention.

1. INTRODUCTION

Local 5G networks have gained attention in recent years, and different stakeholders have started to establish local and often private mobile communication networks within specific settings, such as factories (Matinmikko, Latva-aho, Ahokangas & Seppänen, 2018; Ahokangas, Matinmikko-Blue, Yrjölä & Hämmäinen, 2021). Several key business opportunities for local 5G networks have been identified. These include offering hosted local connectivity to different mobile network operators (MNOs) in specific locations resulting in neutral host model, and/or providing secure local networks for vertical-specific needs with locally tailored services resulting in private networks (Matinmikko, Latva-Aho, Ahokangas, Yrjölä & Koivumäki, 2017). Local 5G networks may be expandable to a variety of location and context-specific use cases in e.g., hospitals, campuses, shopping malls, and mass event arenas, or to accommodate the distinct business-related requirements of e.g., automotive, media, entertainment, health, utility, and industry vertical sectors' opportunities for tailored offerings (Ahokangas, Matinmikko-Blue, Latva-aho, Seppänen, Arslan & Koivumäki, 2022).

However, the emergence and commercial success of *local private networks* in 5G and beyond depend on the recognition and acceptance, in short, *legitimacy* (Suchman, 1995) of the concept in the eyes of the different stakeholders of the mobile communications industry/ecosystem (Marano, Tallman & Teegen, 2020; Thomas & Ritala, 2022), and specifically so by the regulatory authorities (Ahokangas et al, 2021; Yrjölä, Ahokangas & Matinmikko-Blue, 2022). Legitimacy can be seen as a 'proxy-indicator' for assessing the complex institutional dynamics that influence the embedding of a new industry in relevant structures (Bergek, Jacobsson & Sandén, 2008). Moreover, a solid regulatory framework is imperative for the establishment of local 5G and beyond networks to ensure competition, innovation, and the emergence of new services. Thus, the process that is needed to gain legitimacy for the local private 5G and beyond networks is not only a multi-faceted regulatory challenge, but also a business challenge impacting the business models and ecosystems needed for providing connectivity services in local settings. A specific challenge is the legitimization of local private network services that are offered by non-MNOs in the mobile communications ecosystem (Matinmikko-Blue, Yrjölä, Ahokangas & Hämmäinen, 2021).

In Europe, the current landscape for telecommunication regulation is evolving at the EU level, see e.g., (Bauer & Bohlin, 2022). The telecommunication regulation in the EU member states is quite complex and undertaken on the national, European, and international levels. The EU regulatory framework for electronic communications is formulated as a set of policy objectives, which national regulatory agencies implement with the help of instruments defined at the European level. The member states are currently implementing the provisions of the European Electronic Communications Code (EECC, 2018), relying on related hard law and soft law legal provisions. Regarding the legitimacy of local private mobile communication networks, one of the challenges is the lack of definition for this concept in the EU legal act. More importantly, the newly developed initiatives such as the Digital Service Act (DSA, 2020) and the Digital Market Act (DMA, 2020) are silent about their specific features influencing local private networks. At the same time, new regulations such as those governing the use of artificial intelligence are introduced, potentially influencing local private networks and related services. What regulatory solutions can be developed for local 5G and beyond networks operated by different stakeholders are currently on the agenda of the countries that aim to promote innovation in the context of mobile communication.

Analyzing the landscape of the EU legal framework of electronic communications, the paper proposes a new, legitimization-based approach for understanding and analyzing relevant regulations for local private 5G and beyond networks, especially focusing on non-MNO entities. Decisions to start providing local private mobile communications services are fundamentally business decisions, made under the prevailing regulatory conditions and based on the available enabling technologies in the business ecosystem. The success of these new businesses is influenced by the legitimacy received from the institutional environment (EECC, 2018). Creating new business with the new technology

can thus be seen as a way of testing the legitimacy of that technology, provided that the regulation allows or supports it (Gisca, Ramos de Silva & Dönmez, forthcoming).

Building on the above argumentation, this paper presents an assessment of the most relevant EU legal developments and underlines the legitimacy challenges for local private 5G and beyond networks. It aims to frame the EU telecommunication legal framework relevant for local 5G networks and presents future perspectives to be developed by policymakers. While identifying that the upcoming 5G and beyond local network will have a big societal impact and the regulation will enable their future deployment, there is very little prior research on regulatory challenges and mainly in researching ecosystem legitimacy of local 5G and beyond networks. Therefore, this paper aims to address the following research questions:

- What is the legal framework and its elements relevant to local 5G and beyond networks in Europe?
- How and under which regulatory conditions may the new business in local 5G and beyond networks emerge?

From the methodological perspective, the research addresses recent legal developments at the EU level and presents a thematic analysis of the relevant EU legal instruments in relation to 5G and beyond local networks. The paper proceeds as follows. First, after introduction, the paper presents the developments of the local private 5G and beyond networks. Second, the conceptual framework that comprises ecosystem, business and legitimacy perspectives is presented. Third, we present the methodological approach of the research. Fourth, we identify the elements in the EU legal framework that impact local 5G and beyond networks. Fifth, we analyze the reviewed documents and sixth, identify some specific legitimacy challenges for local 5G and beyond networks of the related regulations and proposes future considerations for policymakers on how those can be addressed.

2. THE EMERGING 5G AND BEYOND LOCAL MOBILE COMMUNICATION NETWORKS

Digital technologies transform our world. Information and communication technologies (ICTs) have an essential role in this transformation and have a big impact on nearly every aspect of society. Earlier, the traditional mobile communication business value chain has been changing incrementally. However, MNOs' market dominance has been shaken by the Internet giants that offer over the top (OTT) services that have reduced MNOs' role to bit pipes (Matinmikko-Blue, Yrjölä, Seppänen, Ahokangas, Hämmäinen & Latva-Aho, 2019). The development of 5G networks has expanded from the traditional MNO-centric deployment models to alternative local network operator models. Local 5G operators are emerging on the mobile market that offers local high-quality services in high-demand spatially confined locations, such as factories, sports arenas and campuses (Matinmikko, Latva-aho, Ahokangas & Seppänen, 2017). Moreover, the 5G technology is expected to further change the mobile communication market structures, by addressing different vertical sectors' specific local service demands. This market development challenges the traditional MNO dominance and progressively opens the market for new business opportunities and new stakeholders including the local private network service providers.

There is a growing interest in the vertical sectors toward the deployment of their own local 5G networks tailored for specific service delivery without being tied to the existing MNOs. The use of 5G within vertical sectors, such as manufacturing, has particularly attracted recent attention and regulators have already taken actions to promote the spectrum assignment decisions in several countries, such as Finland, Germany, and many are considering it. How the spectrum allocation and assignment decisions hamper the emerging local deployment and new operational models has a link to nations' competitiveness through the growing digitalization of all aspects of society and shapes many companies' business opportunities. The original study (Matinmikko-Blue et al. 2019) showed

that the MNO market dominance has continued in many countries with the early 5G spectrum decisions, and only a subset of countries allowed market entry for local and often private 5G networks by introducing local spectrum licensing that was discussed in (Matinmikko et al. 2018). For regulators, there is a choice how to balance promoting efficient spectrum use, fairness, competition, and innovation in spectrum allocation. Currently, different countries have different goals for their spectrum policies, and employ different strategies for local networks. At the same time, the spectrum awarding decisions taken by the regulators in the new 5G bands have varied between different countries significantly, see e.g. (Matinmikko-Blue et al. 2019; 5G Spectrum Observatory). As the spectrum and competition regulation have played a pivotal role in allowing, delimiting, or protecting/safeguarding certain business models applied by the operators, technology-oriented business studies have been complemented with research on regulation and policy as an antecedent for new business opportunities (Yrjölä, Ahokangas & Matinmikko-Blue, 2022).

From the local operator's perspective, a diverse set of service offerings can emerge, ranging from serving MNOs' customers as a neutral host to operating private networks for specific verticals with different revenue potential. Recent studies on regulatory developments and legitimacy for local 5G networks (Matinmikko et al., 2018) have identified several key regulatory elements to be considered by policymakers including access regulation, consumer protection, competition enforcement and economic regulation, intellectual property, privacy and data protection, resource management, network security, taxation, and universal service and accessibility. The future development of 5G technology and markets is undetermined the regulation must be developed with incomplete knowledge and under conditions of uncertainty. Such conditions call for adaptive policy (Bauer & Bohlin, 2022). Therefore, monitoring the experience at the national and international level of the regulatory developments will facilitate the global learning and efficiency of the policy framework. The ecosystem identity, which is a "set of mutual understandings among ecosystem participants regarding central, enduring, and distinctive characteristics of the ecosystem value proposition" (Thomas and Ritala, 2021, p. 3), is essential to ecosystem legitimacy attainment and value realization.

3. THE KEY CONCEPTS OF THE RESEARCH

3.1 Legitimacy and legitimation in ecosystem contexts

As an emerging innovation, private local 5G and beyond networks may share several "industry legitimacy" challenges (Kwak & Yoon, 2020; Marano, Tallmann & Teegen, 2020) and according to the existing legal provisions in force, some regulatory related challenges that need to be considered were identified in recent studies (Matinmikko-Blue, 2021). In general terms, legitimacy can be seen to mean that the converged connectivity and data platform constellations are considered appropriate for and accepted by the industry's relevant stakeholders (Kwak & Yoon, 2020; Suchman, 1995). Legitimacy can also be seen as a 'proxy-indicator' for assessing the complex institutional dynamics that influence the embedding of a new industry in relevant structures (Bergek, Jacobsson & Sandén, 2008). To successfully legitimize the new venture in an emerging new industry, managers will have to change and/or create a new structural meaning of norms, practices, and values for it (Turcan & Frazer, 2016). Legitimacy in the industrial context means the consonance of an industry with its institutional environment (Kwak & Yoon, 2020), is defined as the ability to select the "right thing to do" (Palazzo & Scherer, 2006) and it is understood as a "generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed systems of norms, values, beliefs and definitions" (Suchman, 1995). Regulatory interventions influence emerging businesses directly and indirectly, impacting their legitimacy attainment.

The regulatory design provides important boundary conditions to route legitimacy. The quotation of (Palazzo & Scherer, 2006), "a right thing to do," can be interpreted from the mobile

communications business perspective as action-oriented choices and focused on the available opportunity, value creation and capture, and (competitive) advantage. Similarly, the consequences of these actions should be scalable, replicable, and sustainable (Yrjölä et al., 2022). An emergent ecosystem can be considered legitimate by ecosystem participants and other actors in the broader environments when the key managerial choices regarding business opportunities, value creation and capture, and competitive advantages and consequences of the aforementioned choices, scalability, replicability and sustainability are covered or achieved. With the definition of Adner (2017), who described ecosystems as “the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize,” it becomes clear that a value proposition represents an integral and central part of an ecosystem (Adner, 2017). According to the recent studies on the ecosystem (Phillips, & Ritala, 2019)], when such organizational forms are emerging, they require legitimacy to overcome the “liability of newness”. Adopting a collective action lens and taking a legitimacy as a process approach, a process model of ecosystem collective action was proposed, where an orchestrator, complementors, users, and external actors together rule ecosystem legitimacy.

Within this research, we consider legitimacy as a process focusing on the aspects that lead to the emergence of legitimacy (Suddaby, Bitekine & Haak, 2017). The symbiosis of actions based on the business thinking approach in regulatory and business actions may lead to ecosystem legitimacy.

3.2 Business models and ecosystem legitimacy

The business model has become the contemporary paradigm for innovating revealing about *business* and researching firm behavior in increasingly dynamic business environments. The business model is perceived as a tool for conducting boundary-spanning analysis in contemporary business research (Zott et al., 2011; Lanzolla et al., 2020). Business models are made of concrete choices and the consequences of these choices. The scholars contend that they are composed of two different sets of elements: (a) the concrete choices made by management about how the organization must operate, and (b) the consequences of these choices, effects on value creation and/or value capture different designs have different specific logics of operation and create different value for their stakeholders. (Casadesus-Masanell & Ricart, 2010). Scholars distinguish three types of choices: policies, assets, and governance structures. Policy choices refer to courses of action that the firm adopts for all aspects of its. Asset choices refer to decisions about tangible resources. Governance choices refer to the structure of contractual arrangements that confer decision rights over policies or assets. The three types of choices may be depicted from the business constructs as well as for regulatory mechanisms.

The business model can be perceived as a driver for creating competitive advantage through opportunity exploration and exploitation. Given the contemporary business environment, the advantage is rarely sustainable and can quickly render to be uncompetitive (McGrath, 2010). The business model analysis also gives us a sense of firms in action. Advances in ICT and the demands of socially motivated enterprises constitute important sources of recent business model innovations (Casadesus-Masanell & Ricart, 2010). As the theoretical focus in this research, the symbiosis between managerial choices opportunity, value and advantages, and consequences – scalability, replicability, and sustainability in the business ecosystem and regulatory actions for the purpose of legitimacy attainment will be analyzed.

4. THE RESEARCH METHOD

This research aims to explore with a thematic analysis the ecosystem-level legitimacy of emerging local 5G and beyond networks. Thematic analysis is described as a method for identifying, analyzing and reporting pattern themes within data (Braun & Clarke, 2006). The analysis helps answering the

question what the concerns about the legitimacy attainment in the deployment of local 5G and beyond networks are, particularly when not much is known in the explored empirical data. This paper identifies relevant EU legal acts and provides a qualitative and detailed account those as a regulatory source of information and previous research in engineering and business literature. The thematic analysis procedures rely on exploring ecosystem legitimacy from a business and regulatory perspective by searching the previous research on the local 5G and beyond networks in order to give a better understanding of the technical and business developments and identified as relevant EU legal acts, since it has substantial coverage of business and commerce, a wide geographical spread at the EU level, and provides a comprehensive framework of regulatory provisions that the local networks need to be covered and ensure coherent legitimacy attainment. The adopted method allows for conducting an inductive study on a novel phenomenon, illuminating business features expressed via the managerial choices and consequences of the researched context, as well as its specific influence on the legal provisions that were derived.

In general the analytical interventions used in the thematic analysis cover the identification of the themes, reviewing the themes, and searching for themes that according to (Elo & Kyngäs, 2008) are equivalent to the unit of analysis. A theme is defined as a coherent integration of the disparate pieces of data that constitute the finding. It captures important elements of the research questions and represents a level of response patterns or meaning within the data set. By applying the thematic analysis method, in this paper we want to contribute with comprehending, ordering, and provoking implications to extant research (Sandberg & Alvesson, 2020). Within this paper, as an emerging phenomenon, the local private networks require a novel approach that help to re-frame the problem-field, re-order the relevant elements, and support in finding comprehension.

Taking a business-orientated approach towards the regulatory measures reflected in the EU documents developed under the Digital Single Market Strategy (EC DSM Strategy for Europe, Brussels, 2015) we depicted nine EU legal acts from the overall EU regulatory system. Particularly these include the EU 2030 Digital Compass (EC 2030 DC, 2021), the Directive (EU) 2018/1972 of the European Parliament and of the Council establishing the European Electronic Communications Code (EECC, 2018), the Digital Market Act (DMA, 2020), the Digital Service Act (DSA, 2020), the Data Governance Act (DGA 2020), the Data Act (DA, 2022), The Cyber Security Strategy (EC CS Strategy, 2020), the AI Act (EC AIA, 2021), and the E-privacy Regulation (EC ePR, 2017).

Analyzing the specific relevant legal provisions that may be developed further in the national context and tailored towards the deployment of local 5G and beyond networks, we depicted the managerial choices and consequences for emerging 5G and beyond businesses. In the thematic analysis of the EU Digital Legal Framework, we established the key elements and then prioritized the business needs for 5G and beyond local networks to develop a broad understanding of future regulatory settings. Moreover, relying on the regulatory and business perspectives, the analysis proposes for discussion of challenges and future perspectives that policymakers may undertake at the national and international level that pose significant weight for legitimacy attainment. New insights into the studied phenomenon have increased the understanding of a particular phenomenon for informed practical action (Krippendorff, 2004).

The research process is presented in Figure 1. The process comprises three steps, first the identification of the relevant regulatory landscape and its key elements for local and private networks for 5G and beyond, assessment of the managerial implications in terms of managerial choices and consequences, and third, discussion of the consequent regulatory challenges and perspectives.

THEMATIC ANALYSIS METHOD

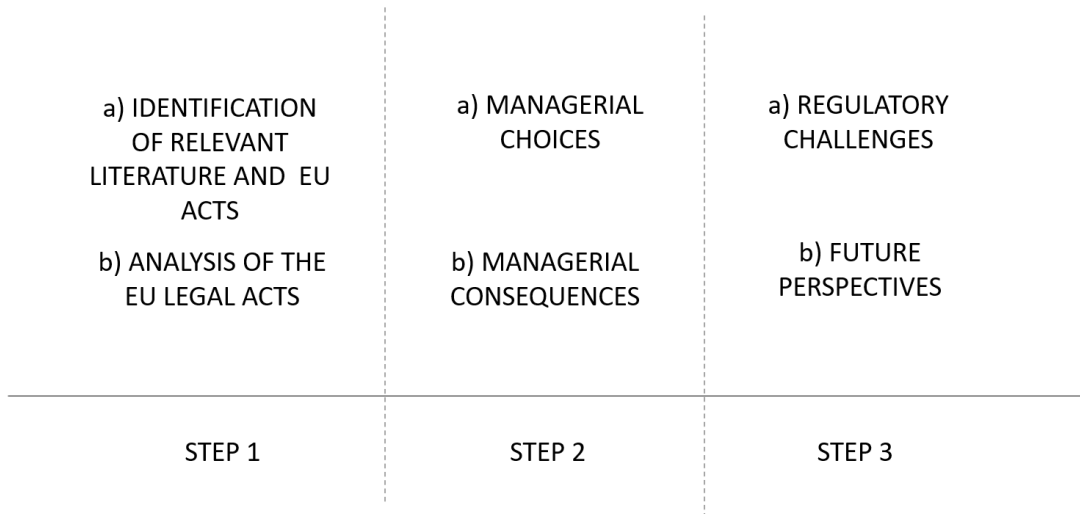


Figure 1. Thematic research process.

A central relevance criterion for the explored contribution is its capacity to unsettle and disrupt existing knowledge about a phenomenon by reframing it in a novel, unexpected and often counterintuitive way (Alvesson and Sandberg, 2013, Cornelissen and Durand, 2014, Davsi 1971, Gergen 1982.). The empirical material used in this article is a source of inspiration not as a guide and ultimate arbitrator (Alvesson and Sandberg, 2013). Intellectual insights take the form of identification, articulation, and challenge of implicit dominant assumption within a field (Davis 1971).

5. IDENTIFIED REGULATORY DEVELOPMENTS RELEVANT FOR 5G AND BEYOND LOCAL NETWORKS

The European Union's Governments, the European Parliament and European Commission have agreed on key regulations that will overhaul the EU Digital Market. The European Commission aspires to make the EU's single market fit for the digital age, moving from the 28 national digital markets to a single market. The Digital Single Market opens new opportunities, as it removes key differences between online and offline worlds, breaking down the barriers to cross-border online activity and moving beyond technology frontiers. The Digital Single Market Strategy (EC DSM Strategy for Europe, 2015) was adopted in May 2015 and it is made up of three policy pillars:

- *An environment where digital networks and services can prosper.* The Digital Single Market (DSM Strategy, 2015) aims to create the right environment for digital networks and services by providing high-speed, secure, and trustworthy infrastructures and services supported by the right regulatory conditions. Key concerns of the Single Market include cybersecurity, data protection/e-privacy, and the fairness and transparency of online platforms.
- *Digital as a driver for growth* pillar aims at maximizing the growth potential of the European Digital Economy (EDE, 2017) so that every European can fully enjoy its benefits, notably by enhancing digital skills, which are essential for an inclusive digital society.
- *Improving access to digital goods and services.*

The strategy seeks to ensure better access for consumers and businesses to online goods and services across Europe, for example by removing barriers to cross-border e-commerce and access to online content while increasing consumer protection. The review of the Telecom Framework is one of the pillars of the EU Digital Single Market Strategy. As one of the EU political priorities, the Digital

Single Market Strategy (DSM Strategy, 2015) echoes the aspirations toward synchronizing the European values from the physical to the digital world.

Figure 2 presents the identified legal instruments and provides a comprehensive structure of the main legislative initiatives that were identified as connected (Serentskhy, 2021) via the key objectives and emphasize another view point from the three-dimensional path outlined by this research. EU legislators are focused to create more effective regulation enforcement, creating a more flexible regulatory environment, and even new, future regulatory frameworks. Allowing businesses to bring a product to market more quickly under existing regulatory conditions, or by testing out adaptations to existing regulation, an iterative, flexible regulatory system may be developed. This will also help obtaining a nuanced understanding of a technology's impact on businesses. However, it is difficult to predict the effects of a technological change until it has become widely adopted. But, once a technology has become entrenched in business and social practices, changing its effects would be difficult. Ex-ante regulation legislation aims to resolve the conflict between the lumbering legislative process and the rapidly evolving technology.

The Table presents the identified regulatory developments having an impact and increased relevance for local 5G and beyond networks. The table presents the objectives, aim, and key content of the regulations and highlights the stakeholders obligations.

The planned legislative changes will introduce new rules for digital ecosystem the reforms which still need final sign off by EUs co-legislators

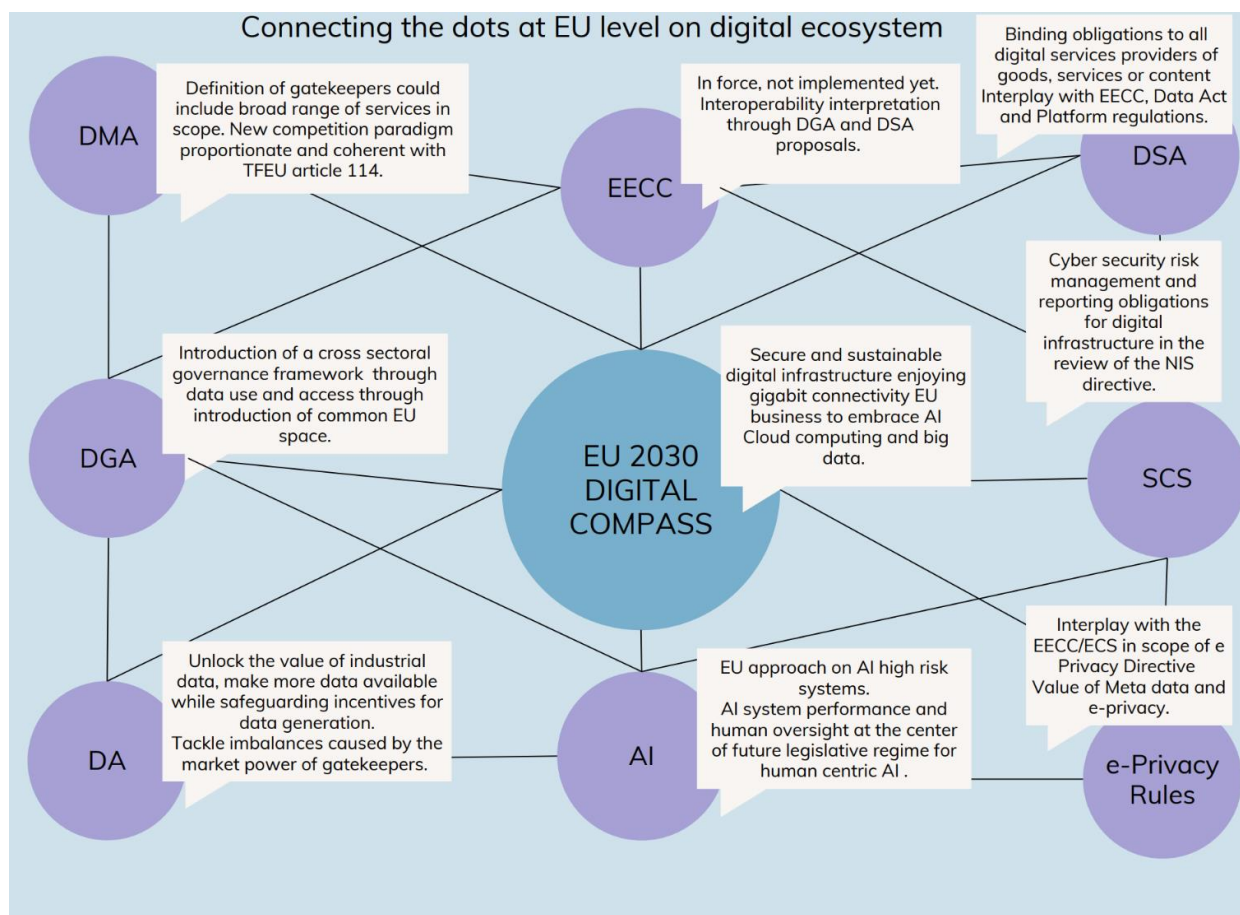


Figure 2. EU's priorities for the Digital Single Market.

5.1 EU 2030 Digital Compass

The EU pursued a human-centric, sustainable vision for a digital society throughout the digital decade to empower citizens and businesses. In March 2021, the European Commission presented a vision and avenues for Europe's digital transformation by 2030. The Digital Compass for the EU's digital decade (EC 2030 DC, 2021) evolves around four cardinal points: Government, skills, infrastructure, and business.

The Commission will start by developing the projected EU trajectories for each target and continues with monitoring the progress of EU member states towards these targets. Furthermore, each Member State would define national projected trajectories, and propose national strategic roadmaps, outlining their consolidated action measures to attain the targets. The progress along with EU and national trajectories would be assessed yearly.

5.2 Digital Market Act

In March 2022, a political agreement was reached on the Digital Markets Act (DMA, 2020) that aims to make the digital market in Europe more transparent, safe and accountable. The new rules deal with various digital issues in the frontier of less digital economies and will have potential global effects. The Digital Market Act (DMA, 2020) will give the European Commission new enforcement powers that could shape the business models of big tech companies since it will oversee 21 new competition rules that fourteen digital gatekeepers-platforms, must adhere to.

With the Digital Markets Act (DMA, 2020), Europe is setting standards for how the digital economy of the future will function. The European parliamentarian Andreas Schwab (EPP, DE) mentioned that "The law avoids any form of overregulation for small businesses. App developers will get completely new opportunities, small businesses will get more access to business-relevant data and the online advertising market will become fairer".

5.3 Digital Service Act

For the first time an agreement on a common set of rules was reached in April 2022 on intermediaries' for example, online marketplaces, social networks, content-sharing platforms, app stores, and online travel and accommodation platforms, their obligations and accountability across the single market that aim to open new opportunities to provide digital services across borders while ensuring a high level of protection to all users. The proposed Digital Services Act (DSA, 2020) aims to set common but tailored obligations and accountability rules for providers of network infrastructure, cloud computing services (such as Internet access providers), hosting service providers, and in particular for online platforms (i.e. online marketplaces and social media platforms). For the first time, full-fledged oversight and enforcement rules are envisaged with the ability to set fines of up to 6% of the global annual turnover of platforms. The legislation defines digital services as "a large category of online services, from simple websites to internet infrastructure services and online platforms." All digital services that conduct business in the EU are subject to the Digital Service Act (DSA, 2020), regardless of where the business is established – even small and micro companies, although the regulations are tailored to firm size. Small to mid-sized digital services make up 90% of impacted businesses in the EU and will be exempt from the most costly regulations. At its core, the Digital Service Act (DSA, 2020) is a regulatory framework that will impose rules around how platforms moderate content, advertise, and use algorithmic processes.

The Digital Service Act (DSA, 2020) will be directly applicable across the EU and will apply 15 months after entry into force or from 1 January 2024, whichever comes later. As regards the obligations for very large online platforms and very large online search engines, the Digital Service Act (DSA, 2020) will apply from an earlier date, that is four months after they have been designated as entering the category of very large online platforms or online search engines.

5.4 Data Governance Act

After the European Parliament, the Council approved in May 2022, a new law to promote the availability of data and build a trustworthy environment to facilitate their use for research and the creation of innovative new services and products. The Data Governance Act (DGA, 2020) represents a robust mechanism to facilitate the reuse of certain categories of protected public-sector data, increase trust in data intermediation services and foster data altruism across the EU. The act is an important component of the European strategy for data, which aims to bolster the data economy. The Data Governance Act (DGA, 2020) complements the 2019 Open Data Directive (EC ODD, 2019), which does not cover such types of data, and creates a framework to foster a new business model – data intermediation services – that will provide a secure environment in which companies or individuals can share data.

For companies, these services can take the form of digital platforms, which will support voluntary data-sharing between companies and facilitate the fulfillment of data-sharing obligations set not only by that law but also by other legislation, be it at European or national level. By using these services, companies will be able to share their data without fear of their being misused or of losing their competitive advantage. Data intermediation service providers will need to be listed in a register. The Data Governance Act (DGA, 2020) also makes it easier for individuals and companies to make data voluntarily available for the common good, such as medical research projects. The new rules will apply 15 months after the entry into force of the regulation.

5.5 Cybersecurity Strategy

The EU Cybersecurity Strategy (EC CS Strategy, 2020) will boost Europe's collective resilience against cyber threats and help to ensure that all citizens and businesses can fully benefit from trustworthy and reliable services and digital tools. Under the new Cybersecurity Strategy (EC CS Strategy, 2020), Member States, with the support of the Commission and ENISA – the European Cybersecurity Agency, are encouraged to complete the implementation of the EU 5G Toolbox, a comprehensive and objective risk-based approach for the security of 5G and future generations of networks. The EU's new Cybersecurity Strategy (EC CS Strategy, 2020) for the Digital Decade forms a key component of Shaping Europe's Digital Future (EC SEDF, 2020), the Commission's Recovery Plan for Europe (EC RPE, 2020) and of the Security Union Strategy 2020-2025 (EC SU Strategy, 2020).

5.6 Data Act

The Data Act (DA, 2022) is a key measure for making more data available for use in line with EU rules and values. The proposed Regulation on harmonised rules on fair access to and use of data The Data Act will make an important contribution to the digital transformation objective of the Digital Decade. The Data Act (DA, 2022) will ensure fairness by setting up rules regarding the use of data generated by Internet of Things (IoT) devices. It addresses the legal, economic and technical issues that lead to data being under-used. The Data Act (DA, 2022) clarifies who can create value from data and under which conditions. The main implications and opportunities for European businesses regarding the Data Act are related to objectives for data sharing and access requirements and the act targets a range of companies from service providers and gatekeepers to device manufacturers and public authorities. The Data Act (DA, 2022) has implications for data sharing, interoperability standards, and cloud switching.

5.7 The EU Electronic Communication Code

The European Electronic Communications Code Directive (EECC, 2018) puts in place one of the essential building blocks for a Digital Single Market in Europe (DSM Strategy, 2015). The EU Directive marks a significant revision of the regulatory framework, dating from 2009. It creates a legal framework to ensure freedom to provide electronic communications networks and services. It represents the main legal act which aims to stimulate competition and increase investment in 5G and very high-capacity networks so that every citizen and business in the EU can enjoy high-quality connectivity, a high level of consumer protection, and an increased choice of innovative digital services. In addition to replacing the previous legislation, the directive introduces a series of new objectives and tasks: strengthened consumer rules aim to make it easier to switch between service providers whilst offering better protection.

5.8 AI Act

The Proposal for a Regulation of the European Parliament and of the Council lays down harmonized rules on artificial intelligence (Artificial Intelligence Act, 2021) and amend certain Union legislative acts. The Commission aims to address the risks generated by specific uses of AI through a set of complementary, proportionate, and flexible rules. It applies to all sectors (except for military), and to all types of artificial intelligence. These rules will also provide Europe with a leading role in setting the global gold standard. The legal framework for AI proposes an approach, based on three risk categories. First, applications and systems that create an unacceptable risk, such as government-run social scoring of the type used in China, are banned. Second, high-risk applications, such as a CV-scanning tool that ranks job applicants, are subject to specific legal requirements. Lastly, applications not explicitly banned or listed as high-risk are largely left unregulated. Like the European Union's General Data Protection Regulation (GDPR, 2016), the AI Act (AIA, 2021) could become a global standard. It is already having impact beyond Europe.

5.9 E-Privacy Regulation

The ePrivacy Regulation (ePR, 2017) is a proposal for the regulation of various privacy-related topics, mostly in relation to electronic communications within the European Union. The regulation is intended to provide up-to-date rules and procedures, for instance for the increasingly popular messenger services— and to do so uniformly throughout the EU. It lays down rules regarding the protection of fundamental rights and freedoms of natural and legal persons in the provision and use of electronic communications services. It ensures free movement of electronic communications data and electronic communications services within the EU member states.

Table 1. Analysis of the EU package acts on the Digital Single Market.

Evaluated EU Acts and their relevance	The aims and key contents	Key stakeholders and obligations
2030 Digital Compass (2030 Digital Compass: the European way for the Digital Decade, Brussels, 2021) <ul style="list-style-type: none"> Maps out a clear path toward a common vision and actions for Europe to succeed in the Digital Decade 	<ul style="list-style-type: none"> To pursue digital policies that empower people and businesses to seize a human-centered, sustainable, and more prosperous digital future Four cardinal points for mapping the EU trajectory are articulated A digitally skilled population and highly skilled digital professionals 	Key stakeholders <ul style="list-style-type: none"> Citizens Business Public services Obligations <ul style="list-style-type: none"> Putting people and their rights at the center of the digital transformation Supporting solidarity and inclusion Ensuring the freedom of choice online Fostering participation in the digital public space Increasing safety, security, and empowerment of individuals Promoting the sustainability of the digital future

	<ul style="list-style-type: none"> Secure and performant sustainable digital infrastructures Digital transformation of businesses Digitalization of public services 	
<p>Digital Service Act (Regulation of The European Parliament and of the Council on a Single Market for Digital Services (Digital Services Act) and amending Directive 2000/31/EC, Brussels 2020)</p> <ul style="list-style-type: none"> Strengthen the responsibilities and supervision of intermediary service providers to ensure less citizen exposure to illegal content and products online 	<ul style="list-style-type: none"> Contribute to the proper functioning of the internal market for intermediary services Set out uniform rules for a safe, predictable, and trusted online environment, where fundamental rights enshrined in the Charter are effectively protected 	<p>Key stakeholders</p> <ul style="list-style-type: none"> Intermediary service providers Social networks Online marketplaces Hosting services <p>Obligations</p> <ul style="list-style-type: none"> Transparency Due Diligence Content moderation Risk management Online advertising rules
<p>Digital Market Act (Regulation of the European Parliament and of the Council on contestable and fair markets in the digital sector (Digital Markets Act, Brussels 2020)</p> <ul style="list-style-type: none"> Promote fair competition in digital markets Give SMEs a chance to participate better in the data economy Establishes clearly defined obligations vis-a-vis a very limited number of cross-border providers of core platform services 	<ul style="list-style-type: none"> Foster innovation, growth, and competitiveness, and facilitate the scaling up of smaller platforms, small and medium-sized enterprises and start-ups under a clear framework at EU level Prevent gatekeepers from imposing unfair conditions on businesses and end users and at ensuring the openness of important digital services 	<p>Key stakeholders</p> <ul style="list-style-type: none"> Largest online platforms Social networks Search engines Online marketplaces Advertising services etc. <p>Obligations</p> <ul style="list-style-type: none"> Transparency Due diligence Prohibition of unfair practices Data portability & interoperability Access for business users
<p>Data Act (Regulation of the European Parliament and of the Council on harmonised rules on fair access to and use of data (Data Act), Brussels, 2022)</p> <ul style="list-style-type: none"> Facilitate access to and use of data, including B2B and B2G in exceptional cases Ensure fairness in the allocation of data value among actors in the data economy Very relevant for SMEs as data portability requirements allow shifting between services 	<ul style="list-style-type: none"> Create a mechanism to enable the safe reuse of certain categories of public-sector data that are subject to the rights of others. 	<p>Key stakeholders</p> <ul style="list-style-type: none"> Product manufacturers & service suppliers in EU Data holders and data recipients in EU Public bodies and EU institutions Providers of data processing services <p>Obligations</p> <ul style="list-style-type: none"> New rules on access and use of non-personal data Data portability, facilitating switching and interoperability The fair, reasonable, and non-discriminatory approach in data sharing contracts Public usage of data
<p>Cybersecurity Strategy (New EU Cybersecurity Strategy and new rules to make physical and digital critical entities more resilient Brussels, 2020)</p> <ul style="list-style-type: none"> Fortify efforts for a secure digitalization Promotes norms for world-class solutions and standards of cybersecurity for essential services and critical infrastructures and drive the development and application of new technologies 	<ul style="list-style-type: none"> Ensure a global and open Internet with strong safeguards where there are risks to security and the fundamental rights of people in Europe Build resilience to cyber threats and ensure citizens and businesses benefit from trustworthy digital technologies 	<p>Key stakeholders</p> <ul style="list-style-type: none"> Key services and infrastructures energy, medium and large entities from more sectors, transport, banking, financial market infrastructures, health, drinking water, wastewater, digital infrastructure Public administration and space EU <p>Obligations</p> <ul style="list-style-type: none"> Address both cyber and physical resilience of critical entities and networks Reform the rules on the security of network and information systems Boost cybersecurity and match EU-level investment Complete the implementation of the EU 5G Toolbox, a comprehensive and objective risk-based approach for the security of 5G and future generations of networks

<p>EECC (Directive (EU) 2018/1972 of the European Parliament and of the Council establishing the European Electronic Communications Code, 2018)</p> <ul style="list-style-type: none"> • Encourage the investment in very high-capacity networks, such as 5G and optical fiber. • Promote competition, including an “efficient infrastructure-based competition” • Develop the internal market across the EEA • Ensure the protection of consumers 	<ul style="list-style-type: none"> • Promote access to and take-up of very high-capacity connectivity (fixed and mobile) across the EU • Respond to the increasing convergence of telecommunications, media and information technology so that “all electronic communications networks and services should be covered to the extent possible by a single European electronic communications code established by means of a single Directive”. 	<p>Key stakeholders</p> <ul style="list-style-type: none"> • Electronic communications networks • Electronic communications services • Over-the-top players • Public bodies and EU institutions <p>Obligations</p> <ul style="list-style-type: none"> • Provide operators with predictable regulation • Ensure there is no discrimination between network and service providers operating under similar circumstances • Apply the regulation in a technology-neutral fashion whenever possible and relevant • Rules facilitating new market entrants • Implements the “use it or lose it principle” with respect to the withdrawal of spectrum licenses, • Facilitates a shared use of mobile frequencies
<p>Data Governance Act (Regulation Of The European Parliament And Of The Council on European data governance, Brussels, 2020)</p> <ul style="list-style-type: none"> • Make public sector data available for reuse • Facilitate the exchange of data in EU and with 3rd countries • Enable data sharing for the common good 	<ul style="list-style-type: none"> • Increase trust in data sharing and establish trusted data use for research and innovation, among other things. 	<p>Key stakeholders</p> <ul style="list-style-type: none"> • Public sector • Data sharing ‘trust’ services • Citizens <p>Obligations</p> <ul style="list-style-type: none"> • Confidentiality • One-stop shop mechanism for data requests
<p>AI Act (Regulation of the European Parliament and of the Council Laying Down Harmonised Rules On Artificial Intelligence (Artificial Intelligence Act And Amending Certain Union Legislative Acts, Brussels, 2021)</p> <ul style="list-style-type: none"> • Ensure that AI systems are safe and respect fundamental values • Create legal certainty to facilitate investment and innovation in AI 	<ul style="list-style-type: none"> • Addresses the risks stemming from the various uses of AI systems and promotes innovation in the field of AI 	<p>Key stakeholders</p> <ul style="list-style-type: none"> • Providers placing AI systems on the EU internal market • Users of AI systems within the EU • Providers and users of AI in a 3rd country where output used in the EU <p>Obligations</p> <ul style="list-style-type: none"> • Ex ante risk assessments • Respect for fundamental rights • Transparency towards users • Post-market monitoring and reporting • Human oversight
<p>e Privacy (Regulation of The European Parliament and of The Council concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications, Brussels 2017)</p> <ul style="list-style-type: none"> • It specifies what forms of electronic information enjoy its protection and how businesses can use such data. • It introduces rules on cookies, direct marketing, and business-to-business communications and will replace the outdated ePrivacy Directive from 2002 	<ul style="list-style-type: none"> • Aims to increase user security, the confidentiality of communication and metadata, to define clearer rules for technologies such as cookies, and control of spam 	<p>Key stakeholders</p> <ul style="list-style-type: none"> • Electronic communications services • Electronic communications software • Natural and legal persons who use user-related information to send marketing messages <p>Obligations</p> <ul style="list-style-type: none"> • Adjusting data anonymization • Rules for the use of metadata • Access to information on end-user devices

6. MANAGERIAL CHOICES AND CONSEQUENCES RELATED TO THE LEGITIMACY OF 5G AND BEYOND LOCAL NETWORKS

The review of telecommunication provisions presented in the previous chapter cover the main pillars of the EU Digital Single Market Strategy (EC DSM Strategy, 2020). Any time a new wave of

technologies and related business models emerges, policymakers, therefore, face the question of whether the existing legal and regulatory framework is appropriate or whether a different market design might allow more fully to realize the potential benefits for society. Our review indicates that the regulatory landscape of mobile communications networks, especially in the case of local private networks in 5G and beyond, has changed and includes now new areas to be considered. It is clear, that a new holistic approach is needed to make sense of this regulatory landscape. Following the thematic analysis of the EU identified legislative pillars for the digital ecosystem provisions, the EU Digital Legal Framework, we identified managerial *choices* related to new opportunities, value creation/capture, and advantages that regulations should consider for local 5G and beyond networks. Similarly, we identified managerial *consequences* related to scalability, replicability, and sustainability for the local 5G and beyond networks. Figure 3 presents the managerial choices and consequences for 5G and beyond local network businesses that arise from the analyzed EU Digital Legal Framework.

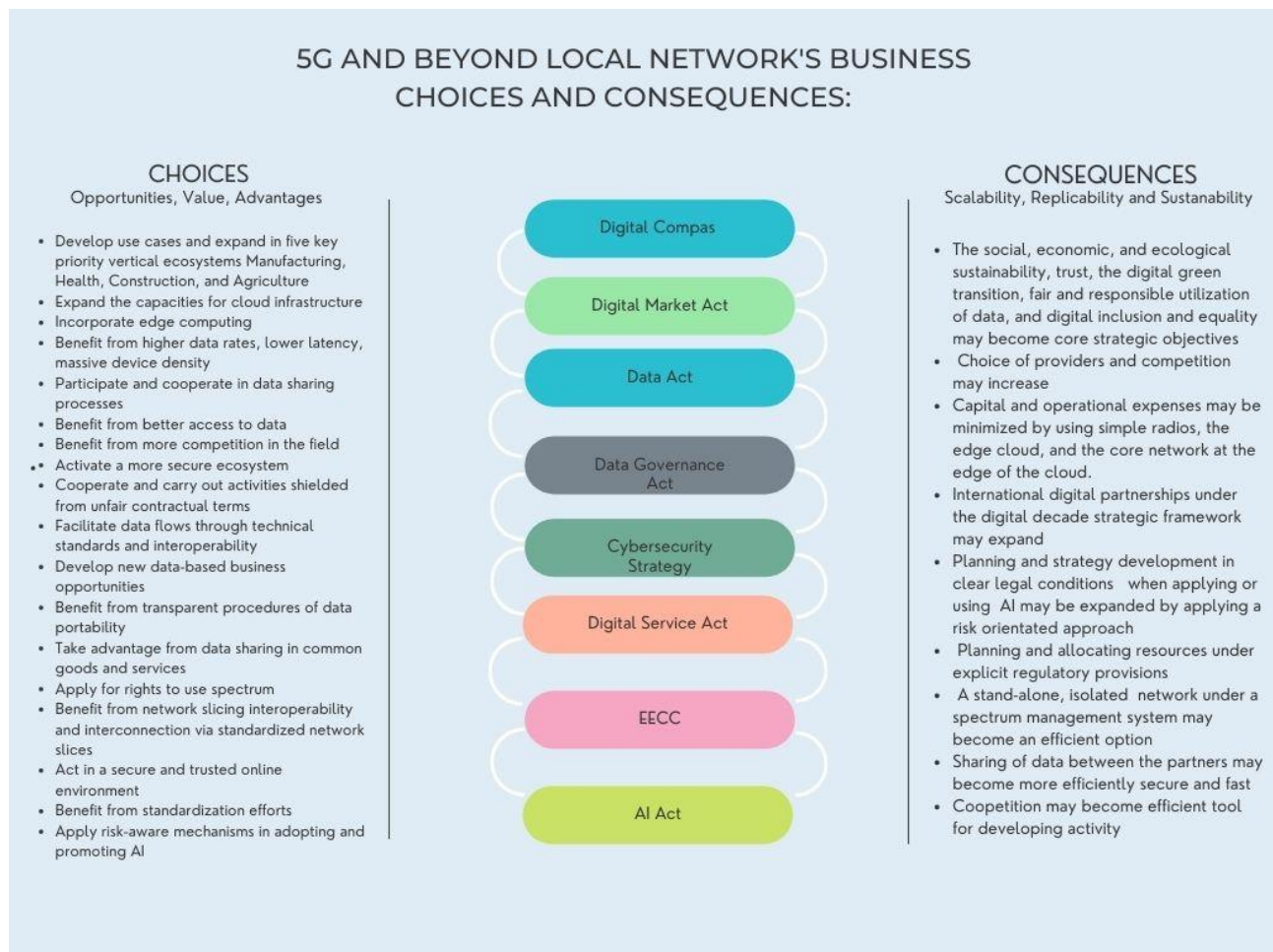


Figure 3. Managerial choices and consequences for emerging 5G and beyond local private networks.

The EU Digital Legal Framework does not contain definitions or specific rights or obligations for local 5G and beyond networks for offering services including high-resolution transmission, remote control, connection between numerous sensors, security within the private closed network, internal wireless network with minimum interference, flexible allocation of network resources.

The EU Digital Legal Framework may trigger the following identified managerial choices. New opportunities are expected to emerge based on new digital communication features such as high-precision holographic media or digital senses provided over the network. For example, the gigabit

network connectivity will allow value creation by meeting various vertical-specific industry demands. Manufacturing SMEs could have local access to cloud-based innovative industrial services platforms, such as Manufacturing-as-a-Service and marketplaces to boost the visibility of their production capacities. Health data and health records could be collected and aggregated quickly locally, and in agriculture the deployment of edge capabilities connected to machinery would allow collecting data in real time and providing advanced services to farmers for harvest prediction or farm management and optimise food supply chains. Especially the areas labeled as strategic areas under the provisions provided by the 2030 Digital Compass (2030 DC, 2021) may present various business opportunities from a managerial perspective. New choices may arise from remote application servers that will be easier to access, bring more information, media content, utility applications, and realistic forms of communication directly to the consumer via edge clouds.

End-to-end vertical solutions for the digital transformation, especially related to corporate activities and for solving the urban issues foreseen by the EU Digital Legal Framework, may create new opportunities based on edge computing, network slicing, low latency communications and massive machine communications, allowing the emergence of new businesses. Especially the novel data and data sharing based opportunities call for a transparent legal environment. Moreover, the EU Digital Legal Framework on digital ecosystem promotes a social, ecologically, and economically sustainable environment that influence managerial decisions in emerging local 5G and beyond networks.

The uptake of digital solutions and the use of data will trigger managerial consequences related to transitioning to a climate-neutral, circular, and more resilient economy. As highlighted in the European Data Strategy (EC DS, 2020), the volume of data generated is greatly increasing and a growing proportion of data is expected to be processed at the edge, closer to the users and where the data are generated. This shift will require the development and deployment of fundamentally new data processing technologies encompassing the edge, moving away from centralized cloud-based infrastructure models. These new trends will generate new managerial consequences related to increasing distribution and decentralization of data processing capacities and suitable cloud supply. Seeking replicability, the managers will draw on the partnership development that is reflected under the legal provisions. Acting in a clear risk-orientated environment that will permit resource allocation and planning in stable conditions allows for reaching scalable business decisions. Adopting a business-oriented approach toward regulation will enable the deployment of 5G and beyond local private networks and facilitate its legitimacy attainment.

7. REGULATION CHALLENGES AND PERSPECTIVES

The cross-cutting impact of digital innovation and data have removed old sector boundaries and created new legitimacy challenges for emerging sectors. Emerging businesses have removed old system boundaries, directly challenging old practices. In response to these changes, we observe the emergence of proactive, future-facing and innovation-enabling approaches to regulation in Europe. We are beginning to see a change in both the theory and practice of regulation with the emergence of a new field as “ex-ante” regulation or “anticipatory”. The new approach to regulation helps reframe regulation as a supportive tool for the responsible development and use of new technologies and business models. New and existing methods are helping regulators to better support innovation as it emerges, drive innovation directly and respond faster or act preemptively to prevent public harm.

This study identified regulatory challenges and particular elements relevant for 5G and beyond local networks from the EU Digital Legal Framework that pose legitimacy challenges that may be considered further. The Figure 4, introduces the identified regulatory challenges and perspectives for legitimacy attainment.

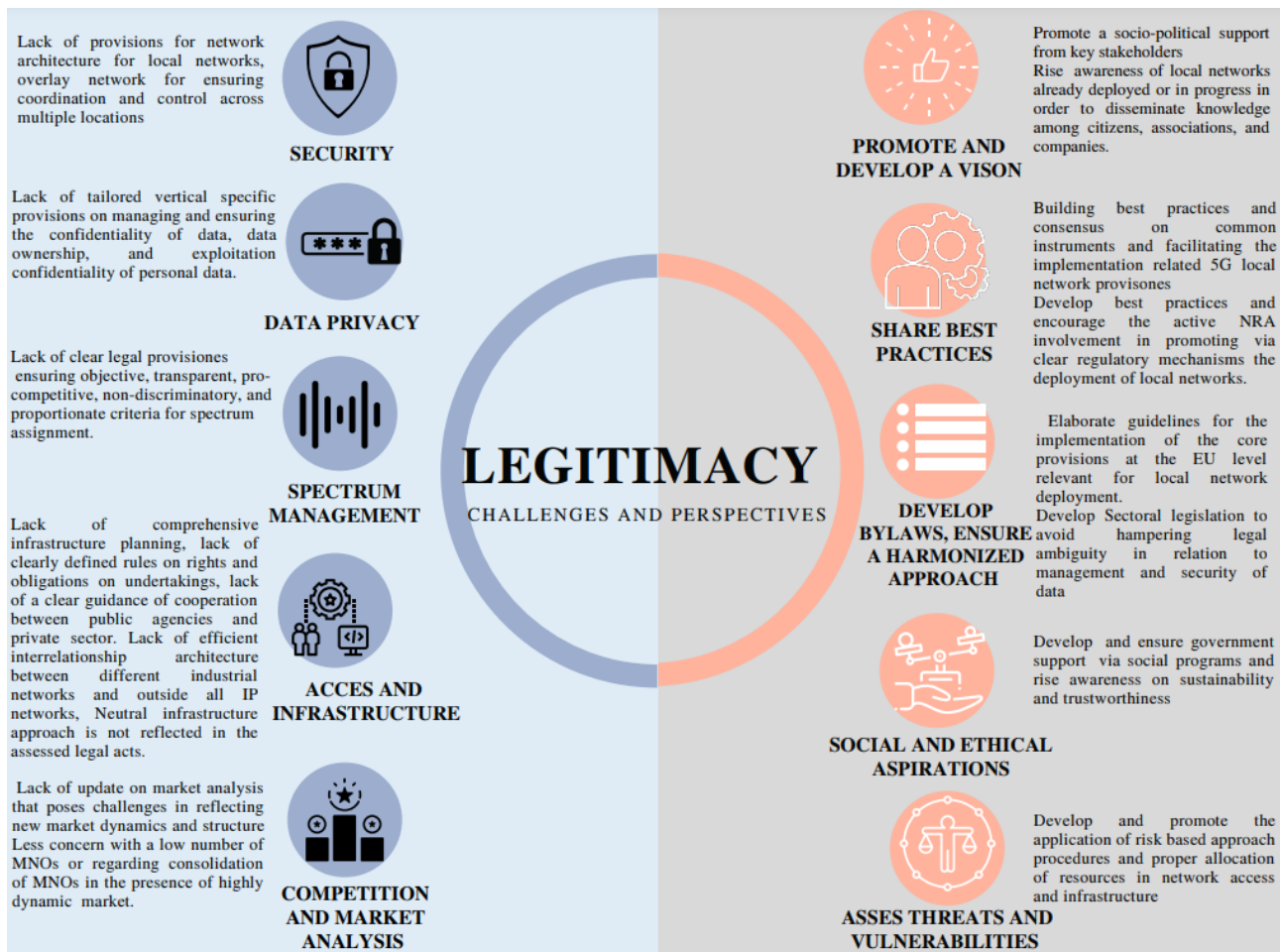


Figure 4. Legitimacy challenges and perspectives.

The EU Legal framework provisions for ensuring security within and between the networks and coordination and control across multiple locations are not covering in detail the specific features and characteristics of 5G and beyond local mobile communication networks, especially for those not deployed by the MNOs, and neither define their main characteristics. However, security and privacy are the main elements that need to be considered in all the network slice installations for local 5G and beyond network deployment. Clear and tailored provisions for vertical-specific industries on managing and ensuring the confidentiality of data ownership and exploitation of personal data are not defined and developed in the EU legal framework, which may have a cascading effect on the quality of implementing measures by the national regulatory authorities (NRAs) at the national level. Current spectrum management awarding mechanisms are designed for wide area MNO networks and do not properly address the emerging local 5G and beyond networks.

One of the core elements vital for the deployment and emergence of 5G and beyond local networks are market analysis and competition provisions. Clear and transparent delineation of the relevant markets and firms present in multiple related markets was not reflected in the analyzed content. Lack of market monitoring framework and developed criteria pose obstacles for emerging of 5G and beyond local network.

The analysis emphasizes future perspectives for regulators and business in ensuring a qualitative step beyond, for legitimacy attainment. First and foremost, promotion and developing a vision on local 5G local network to disseminate knowledge and promote a positioning for acceptance among citizens associations and companies needs a prioritization approach. Building best practices and common instruments and facilitating the harmonization of implementation of legal provisions will represent an efficient tool for tackling regulatory and business challenges. To elaborate and share best practices

and tailored implementation mechanisms for encouraging the active participation of the NRA is a perspective that needs to be treated with proper allocation of resources at the EU level. Ensuring a harmonized approach of the NRAs in developing by-laws and guidelines for implementation of EU directives with the support of EU monitoring bodies needs to be expanded. Also, promoting a social and ethical approach via the government and public-private-people (PPP) programs are nowadays at the agenda of some governments that promote innovation. Sharing best practices in this will provide efficient insights for national regulators on the complex regulatory and business landscape.

8. DISCUSSION AND CONCLUSIONS

This paper has identified and provided detailed analyses of the complex regulatory landscape and depicted elements relevant for emerging of 5G and beyond local networks. It characterizes the connection to business opportunities around local 5G networks and identifies regulatory challenges and perspectives for legitimacy attainment. The analysis results indicate that reviewing the evolution of the European digital framework through legitimacy attainment perspective following the incorporated European values is a powerful way of illustrating the shift of the parameters of the regulatory in promoting European standards. Analyzing the EU legal framework relevant for electronic communications, the paper proposes a new approach for considering the legitimacy of emerging 5G and beyond local network regulation. Applying a business thinking approach that enhances the heling effects to embrace technology, promote regulation supporting experimentations and consider systemic effects of policy and regulation.

refrase This paper presents a detailed analysis of the potential effects of identified, regulatory interventions that are currently in place or considered. In contrast to earlier research, the discussion in this paper relies on an approach inspired by the ecosystem legitimacy. As mentioned by Boyd (2000), legitimacy is the result of a process and can be defined as a strategy effectuated by an organization. New business models claim legitimacy to grow, expand, and exist. Ecosystem legitimacy could represent a way for business models to be more active in establishing and promoting a competitive system that encourages the adoption of emergent business models across the ecosystem and ensure efficient private and public cooperation.

Following the previous research, we may assume that regulatory interventions influence the emerging business models, directly and indirectly their impact on legitimacy attainment. The regulatory design provides important boundary conditions to route legitimacy and represent an enabler for innovation. Opportunities, value creation and capture, and advantages as managerial choices and scalability, replicability, and sustainability as managerial consequences provide an overarching approach for guiding the policymakers in developing and streamlining the regulatory actions.

Applying the novel theoretical approach of ecosystem legitimacy developed, the in-depth analysis identifies the EU legal acts that are relevant for local 5G and beyond netowrks business consideration. Moreover, the analysis provides systematized key concepts, actors and obligations that are under consideration of the policy makers agenda. It identifies that security, data privacy, spectrum management access and infrastructure, competition and market analysis are regulatory elements that may pose challenges for legitimacy attainment. Future perspectives for stakeholders were presented and discussed. Ensuring, developing and promoting a vison will increese the social political support and will rise awareness of 5G and beyond local networks. Building and share best practiceswill boost the transparency of regulatory mechanisms and will assist NRA to promote clear and efficient implementation mechanisms. Developing and ensure a harmonized approach via bylaws and sectorial legislations will ensure that the core provisions a properly implemented. Ensuring a social and ethical aspirations via human centric regulations will support awareness on sustainability and trustworthiness. Adopt proper mechanism for assessing threats and vulnerabilities will contribuie to

the application of risk-based approach, proper allocation of the resources in network access and infrastructure.

Although the proposed theoretical approach has reflected on the legitimacy challenges arising from the EU Legal Digital Framework overall, certain regulatory actions and provisions may require extra, context-specific variables when determining legitimacy challenges. As legitimacy is an audience-dependent construct, certain stakeholders and audiences might have specific needs that might have been overlooked within the selected proposed framework and shall be addressed in some further. Additional research into how to facilitate the process of legitimization of 5G ad beyond local network is needed particularly from the stakeholder's perspective

At the same vein, discussions on national sovereignty for not only critical infrastructures but the whole ICT technologies have become a concern, raising needs for new kinds of governance and regulation.

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