Wireless for Verticals (WIVE) 2017-2018
WP2 Drivers and enablers for future media and entertainment

Version: v1.0
Date: 25.3.2019

Deliverable 2.2

Report on new service concepts for 5G

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Executive summary

The report covers the topic of new service concepts based on 5G technology. Service innovation plays an important role both in terms of economic growth and fueling technological development. Service innovation, on the other hand, is closely coupled with business models, which aids in designing viable and feasible services.

The report focuses on service concepts in the media industry. The escalating consumption of mobile media content is one of the main drivers for increased capacity of mobile broadband. We review recent publications related to new service concepts and 5G, as well as summarize current expectations and viewpoints of how 5G will affect the current service range related to the media and entertainment industry.

The data was collected through Delphi-panels, a future research method, in which experts in the field answer questions in several rounds. The Delphi-study was conducted between September 2018 and March 2019. A total of 10 panelists were recruited from the media industry and another 10 panelists represented the information and communications industry (a more technical focus).

The Delphi-study identifies the following service concept categories for the media industry: AR- and VR-based services, services emerging around mixed reality combined with social interaction, social games, real-time media services, as well as advertising-based and personalized media services. The report also briefly discusses emerging business models and new players in media, as well as monetizing strategies for new media services.

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Abbreviations

AI	Artificial intelligence
AR	Augmented reality
IoT	Internet of Things
FWA	Fixed wireless access
MEC	Mobile edge computing
MTC	Machine Type Communication
OTT	Over-the-top (service provider)
VR	Virtual reality

1. Introduction

5G technology has been envisaged to disrupt many industries, as it holds the promise of connecting devices and enabling the Internet of Things (IoT), to name a few examples. Use cases for 5G are generally categorized into, for instance:

- mobile broadband (content everywhere, anytime) with 5G adding capacity, especially to crowded events, such as concerts, sports events etc.;
- media everywhere, including live broadcasting and immersive mixed reality experiences,
- connected cars, smart vehicles, and transportation;
- sensors networks including monitoring, tracking, and automation capabilities;
- and critical control of remote devices, such as heavy machinery.

A rather less broadly discussed issue related to 5G is the emerging service concepts that 5G will enable. Currently, pre-defined use cases have transitioned and are transitioning towards piloting in 5G test networks. However, as 5G networks are expected to be rolled out during the coming year and mobile handsets supporting 5G will become available, focus is moving towards defining service concepts and business models, in which the value 5G supports is clearly defined. While this report does not focus on business models *per se*, they are a vital part of service concepts for 5G and should not be separated from the discussion. For any service concept to gain popularity, it needs a logic and story for how it creates value, what kind of value and to whom the value is being created.

A service concept defines the how and the what of service design and helps mediate between customer needs and an organization's strategic intent. Unlike a product, service components are seldom physical entities, and rather are a combination of processes, people skills, and materials that must be appropriately integrated to result in the 'planned' or 'designed' service. The service concept is *per se* the prototype for service and a detailed description of what is to be done for the customer and how this is to be achieved [1]. The service concept can further be described as [2]

- Service operation: the way in which the service is delivered
- Service experience: the customer's direct experience of the service
- Service outcome: the benefits and results of the service for the customer
- Value of the service: the benefits the customer perceives as inherent in the service weighed against the cost of the service

While 5G will penetrate different industry areas or so-called verticals, the media and entertainment industry is at the forefront of the development and the deployment of 5G. Estimates report $765 billion in cumulative revenues from new services and applications enabled by 5G within the media sector [3]. However, the emerging new business models and new immersive interactive experiences

are vital in order to realize such estimates. Video, gaming, music, advertising, augmented reality (AR), and virtual reality (VR) will be boosted due to 5G, and their potential is still to be unlocked. Artificial intelligence (AI) is expected to disrupt the way we obtain and analyze data on media consumption and use.

This report covers 5G service concepts for the media and entertainment industry, based on (a) previous research and (b) empirical data collected using the Delphi-panel technique. Ten experts from the Finnish media industry and ten experts from the Finnish information, communications and telecommunications (ICT) industry participated in the panels during September 2018 and March 2019. The results from the panels are summarized in this report.

2. 5G transforming media services

One of the expected changes, as 5G is rolled out, is the increase in media usage. An Intel and Ovum co-produced report [3] estimates that the average monthly traffic per 5G subscriber will grow from 11.7GB in 2019 to 84.4GB per month in 2028. At that point, 90% of all 5G traffic will be video. As a comparison, Ericsson estimates mobile video to account for 74% of all traffic in 2024 [4]. However, it is not only the traffic of mobile video that will increase due to 5G; other areas also offer business and revenue opportunities. The Intel-Ovum report [3] categorizes these areas into:

- Enhanced mobile media: video, music, and games
- Enhanced mobile advertising: videos, banners, in-game placement over 5G, and other visual advertising formats that may appear in VR and AR environments
- Home broadband and TV: 5G is used as the primary home internet connection bundled with a TV package, also referred to as fixed wireless access (FWA)
- Immersive media: AR, VR, and cloud gaming
- New media: new applications that do not yet exist and that 5G will enable in the future, e.g., self-driving car entertainment, 3D holographic displays, connected haptic suits in gaming

3. Service concepts and 5G

When it comes to 5G-enabled service concepts, [3] mentions areas, where service concepts will emerge. Firstly, *immersive media* (AR, VR) contains the promise of whole new categories of media, making use of especially low latency. For instance, fully interactive gaming can be made technological and economically affordable in 5G.

Secondly, *localized content delivery*, relying of mobile edge computing (MEC), allows for local storage of content. This brings down the cost of transporting the content and even making it easier

for operators and content providers to efficiently provide targeted localized content. This enables, e.g., the delivery of new live-media experiences in large public venues such as stadiums and concert halls [3].

Thirdly, *network slicing*[1] allows for dedicated networks for media distribution. This brings new business opportunities to, for instance, operators, who can sell specific levels of performance to media companies or other content distributors. For instance, an operator could take a network slice and dedicate it to 4K video streaming or to the delivery of high-profile real-time events.

Fourthly, *in-car entertainment* will rely on 5G: the connected car will free up driver and passengers to consume more media while travelling. A combination of network capacity, low latency, and localized storage will improve car connectivity at high speeds, reducing network lag and stalling.

Finally, enterprise AR and haptics are mentioned as a means to share new product-design work across globally dispersed markets in real time.

It is evident that the above-mentioned categorization is based on technical features. Yu et al. (2017) [5] offer another perspective by identifying the service concept categories for 5G from the point of view of the end-user's experience:

- Immersive 5G services: VR/AR, massive contents streaming
- Intelligent 5G services: user-centric computing, crowded area services
- Omnipresent 5G services: Internet of Things
- Autonomous 5G services: smart transportation, drones, robots
- Public 5G services: disaster monitoring, private security/public safety, emergency services

4. Methodological notes: Delphi study on future 5G media services

The Delphi approach [6] is a widely used futures research method. It presents numerous advantages in comparison to group interviews or workshops. Instead of highlighting individual perspectives, it fosters the emergence of community consensus by gathering expert opinions. The Delphi method typically consists of several web-based interview rounds. In between the rounds the experts anonymously suggest and provide mediated feedback to each other's responses. Exposure to open confrontation, group-think, self-censoring, or other similarly detrimental aspects of social interaction during a discussion is therefore limited. In essence, the Delphi method enables experts to freely

[1] A network operator can split the physical network into multiple virtual networks. These virtual networks are then dedicated and to a specific customer and customized to meet the needs of that customer (applications, speed, services, devices etc.).

speculate, in our case in terms of how 5G affects the service range within the media industry, creatively adding new ideas, and boldly challenging the traditional way of thinking.

We chose media and entertainment in Finland as the main industry category, from which experts were recruited to the media panel. We also chose to add another panel, consisting of experts from the ICT field. Both panels consisted of ten experts each. The experts were recruited during May-June 2018 and the Delphi-study was commenced in September 2018. Each expert provided answers and/or comments in each of the four rounds. The question posed in the first round was: "Mention 5-10 aspects that 5G will change in the media industry." After receiving all answers, we raised one issue from the comments to be discussed in Round 2, namely: "[As a result of 5G technology] we will have to rethink norms, language, and rules". After the second round a summary of the answers was prepared and provided to the panelists in a separate document for commenting. The panelists were asked to verify that their comments were included in a proper manner and to give feedback or comments based on the thoughts provided by the other panelists. The third round thus provided the panelists with a categorization of the areas and/or service concepts within the industry that 5G would affect. Again, the comments were collected and analyzed before moving on to the fourth round. In the fourth and final round, the panelists were asked to prioritize the identified changes to the service range within the media industry. The main question related to how significant the change would be on the service range, would it be realized as described in the third round.

Rounds	**Time period**	**Method**	**Question/request**
Recruitment	1.6 -30.8.2019	E-mail and phone	Commitment to the study
1	1.9-30.9.2019	Question sent per e-mail	Mention 5-10 aspects that 5G will change in the media industry
2	1.10-30.11.2019	Question sent per e-mail	"[As a result of 5G technology] we will have to rethink norms, language, and rules"
3	17.1-14.2.2019	Word-document sent per e-mail	Verify response and comment on other panelists' thoughts
4	20.2-31.3.2019	Link to Webropol sent per e-mail	Prioritize the importance of the changes

Table 1. The process of the Delphi-method

The Delphi-study was designed based on the research by Nenonen and Storbacka (2018) [7] on market creation and the forming of markets. They study market change according to a set of categories, in which change can be detected and observed:

1. Products and price
2. Customers and use
3. Channels

4. Supply-side network
5. Representations
6. Norms

The responses from the panelists were categorized according to these themes. In the first round, the categories “Representations” and “Norms” received little attention, and therefore the second round in the Delphi-study focused on these categories. The categories guided the data analysis. Next, the identified themes in the data are presented, focusing on (a) new service concepts and (b) expected changes in business models in the media industry.

5. Impact of 5G on the media industry

5.1 New media service concepts

AR- and VR-based services

AR and VR are not new phenomena. Nevertheless, 5G is expected to bring the much-awaited boost towards introducing these technologies to mass markets. AR and VR will become important especially related to entertainment services, but also related to news content. It is expected that different types of VR content can be streamed live, which spurs new service concepts and ideas. Users may follow live events such as concerts or sports events at home, which *per se* allows for new business opportunities and revenues. For instance, 360VR content is mentioned as a potential service. Services within the learning and education area are possible, e.g., self-study content, school projects etc. Cultural events and productions are a third area mentioned, with potential for new service concepts as wireless connectivity enables fast and reliable solutions to distribute content (also augmented content).

From the media production point of view 360-cameras and HD-cameras will become a part of media technology, used wirelessly over 5G networks, also in real-time broadcasting. There is potential for the birth of *virtual media*, which allows users to enter the sites, from where news is broadcasted, or enter the points of action related to the news. Streaming services are also a part of virtual media. AI may be used in order to analyze data transmitted via cameras.

Another area, where AR and VR will enable new service concepts relates to *added information* at sports events (speed, acceleration, measurements, location information etc.), which can be offered as an additional service in virtual realities or for live broadcasting events.

Potential media service concepts
- Live VR content streaming, e.g., concerts, sports events, cultural events etc.
- Virtual media, including virtual access to news sites
- VR also outdoors, not only at home or at indoor gaming sites
- Different virtual items can be bundled in existing services or purchased as an add-on service

Potential for production
- Wireless production sites using 360- and HD-cameras
- AI analyzing data transmitted by cameras

A topic not raised in the Delphi-study relates to haptics in experiencing the Internet and especially VR. For instance, highly responsive haptic suits merged with advanced VR capabilities brings a new sensation dimension to media consumption. This type of new VR experience will emerge in 2025 [3] and 5G is estimated to be a key driver in the development and adoption of responsive use of VR.

Mixed realities and social games

The gaming industry will develop as a result of 5G connectivity, as wireless gaming is enhanced through, for instance, increased speed and no delays (low latency). *Multiple player games* will increase in popularity, especially in virtual realities. AR games will make up more than 90% of 5G AR revenues by 2028 ($35.7 billion globally) [3]. *Social AR*, on the other hand, will provide new opportunities, as media consumers may choose AR-content, share it with peer groups, and jointly impact the content. Social interaction is at the core of the future gaming services.

Potential media service concepts
- Games based on social interaction, with the potential to impact VR/AR content jointly and in real-time
- Multiplayer games in virtual environments

Potential for production
- User generated virtual content, collaboratively designed content

Video-based media services

5G is not expected to disrupt the increasing consumption of video. Rather, new forms of video will emerge. Current video storytelling formats rely on videoblogs (vlogs), long video content (TV-formats), short videos (news etc.), and videos posted in social media. In the future, video formats

will become more fragmented and, due to fast 5G networks, complemented by *live videos*, *video-messaging* and *video-shopping*.

Potential media service concepts:
- Video-shopping
- Video-messaging

Potential for production:
- More user generated content, collaboration with influencers as regards advertising and brand promotion
- Collaborate with brands and vertical industry players in order to provide dedicated networks for video content

Real-time media services

Real-time *translations* indicate that there is no need to translate content into local languages before the content (show, movie etc.) is broadcasted. Instead, language translation occurs in real-time.

Another area expected to undergo change concerns *digital signage*, which may transfer from an information system providing info to a more open distribution channel of various kinds of content, namely intelligent walls and surfaces conveying information (advertising, instructions, and other content).

In addition, *user generated content* is expected to increase, especially as regards live and real-time content. A user may generate content to a large number of people in real-time using currently available mobile handsets.

Potential media service concepts:
- Real-time distribution of information at public places via surfaces such as walls, tables etc.
- Real-time language translation
- User generated content

Potential for production:
- Currently available mobile handsets allow for the real-time sharing of content (as opposed to longer production cycles consisting of recording and editing)
- Creating media content is no longer dependent on professional cameramen or similar as any media consumer is able to produce high quality media content, e.g., streaming events or producing video content

Advertising-based and personalized media services

Advertising and the way businesses communicate with their customers will be disrupted as a result of the increased use of real-time media content and the possibility to analyze data in real-time. The opportunity for two-way communication enables faster reaction, e.g., when a consumer consumes certain media content, advertising can adjust and offer more contextually congruent marketing messages, contributing to potential digital consumer journeys towards purchase or other call-to-action. Advertisers will have access to more detailed data, for instance, concerning usage of mobile videos (compared to currently available data, which is mainly based on information on when the video is initiated and ended), interaction with content, etc. Personalization of media content will become more important, enabling also targeted and hyper-local media content to users. This, however, requires understanding of target groups, advertising and marketing goals, as well as available media content.

5G will have a fundamental role in transitioning traditional advertising toward social and media immersive experiences. Also, as 5G enables IoT and AI capabilities, advertisers will benefit from scale, delivery, and measurements, which are today considered key challenges for mobile ad campaigns.

Potential media service concepts for advertising

- Real-time analysis of media content usage and interaction enables more targeted and contextually congruent advertising content
    - Possibly a third-party actor providing data analysis as a service
- Advertising content can be viewed as media content in itself, with which consumers will want to interact. This allows for brand collaboration and new business relations for those managing a media platform or media content.
    - New areas for advertising and media agencies

Potential for production

- Real-time information on media use as input for the design of services
- Real-time information on media use and preferences
    - Flexible choice of advertiser in the media consumer's digital media journey

5.2 New business models and new actor roles

New business models are expected as regards how we access and consume content such as sports events, gaming, education and learning, cultural events, and entertainment more broadly. Contextual media use is expected to become increasingly important, fueled by AI and machine learning. This, in turn, affects media consumers' daily routines, not to mention how company representatives use information in their daily work and how media content delivered in new ways affect the way work

is conducted. There is, however, a fear of social media companies increasingly controlling the use of media. For instance, Google and Amazon are players that possess a direct link to media consumers; there is a fear of media use taking place under the control of such actors.

Network slicing will enable the effective use of the 5G network, dedicating network availability based on customer needs. Different actors can then operate in the network; for instance, a brand may operate its own TV-channel, providing broadcasting or media content to people within a specific geographical area. 5G will thus help operators capitalize on mobile media growth by selling 5G network capabilities to over-the-top (OTT) video service providers. In addition, single content creators such as influencers (bloggers, vloggers etc.) may generate high-quality content while on the road or visiting places. New players will enter the media and entertainment industry, linking directly to the media content or acting as brokers or middlemen, with the task of delivering the service, improving service experience or service outcome.

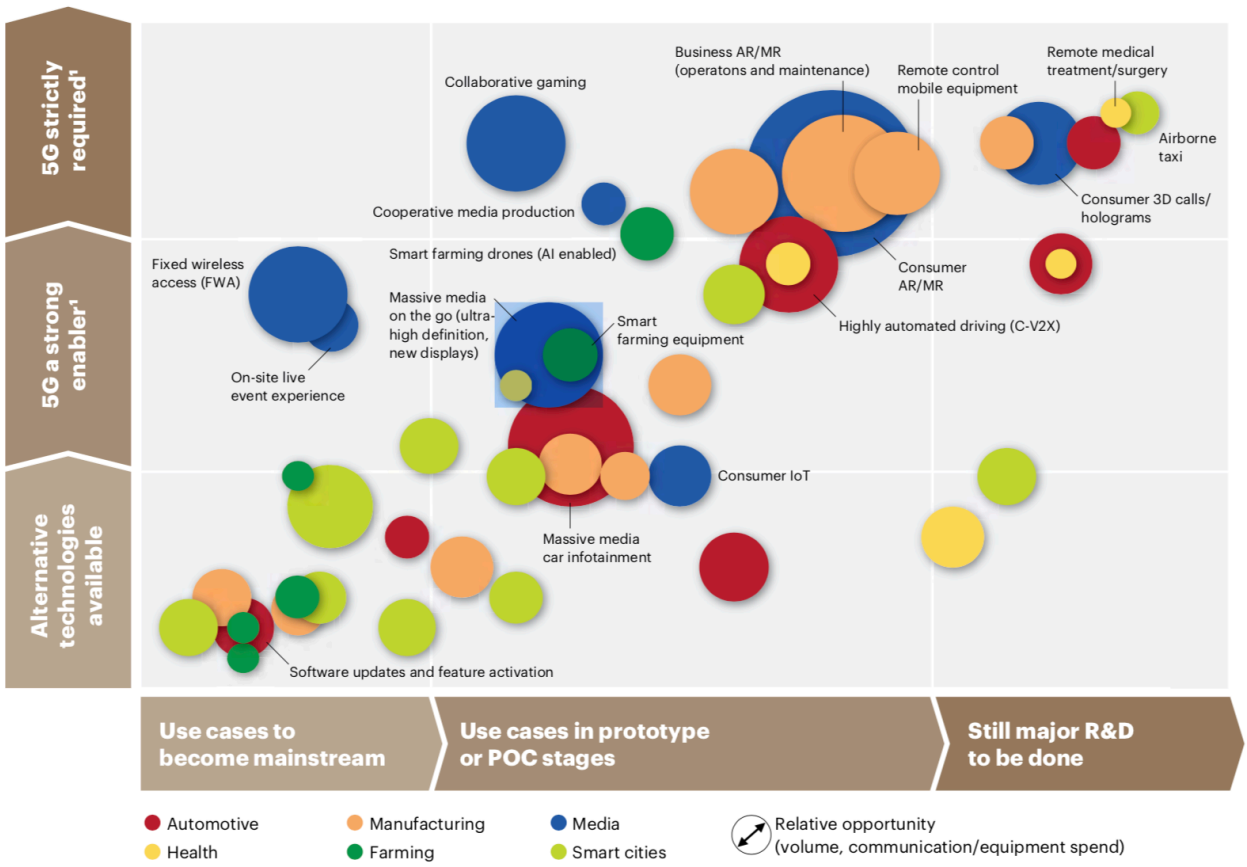
5.3 Monetizing on new services

The different players in the media industry have different strategies for monetizing products and services, i.e., revenue logic. However, as the industry boundaries are blurring, and player roles are shifting, it becomes important to strategize. Ovum [8] suggests the following monetization strategies in 5G:

- Direct monetization (B2B, B2C): if the user requires enhancements such as guaranteed latency, they pay according to a price scheme
- Partner monetization (B2B2x): the service provider may charge and manage service subscriptions on behalf of online players or partners, e.g., guaranteed low latency fee for gaming players such as Twitch, or guaranteed bandwidth fee for content providers such as Netflix.

6. Summary

An important question relates to whether 5G is a prerequisite for deploying the depicted use cases and new service concepts. Most use cases and service concepts rely on more than connectivity and is the sum of many aspects. Freyberg et al. (2018) [9] illustrate for which use cases 5G is critical. Figure 1 depicts for which use cases alternative technologies exist, for which use cases 5G is an enabler, and for which use cases 5G ‘strictly’ is required. Several media-related use cases are placed under “5G a strong enabled” or “5G strictly required”: for instance, on-site live event experiences, collaborative gaming, cooperative media production, consumer AR and VR, consumer 3D calls and holograms.



¹ 5G or alternative wireless technology with features similar to 5G

Source: A.T. Kearney analysis

Figure 1. Use cases and the relation to 5G [9, p. 4]

The report has dealt with mainly the media industry and the expected changes 5G connectivity will bring the service range, and which new service concepts are to be expected. On the consumer side, *AR and VR services* are depicted as a disruption to media consumption and behavior. Devices for AR and VR are still underway with the large players such as Apple, Microsoft, Google, Facebook, and Samsung investing in the development of both devices and software.

A driving factor of AR- and VR-technologies is found in *gaming*, which is also depicted as an area where 5G will enable new and immersive services. Games with multiple players, in virtual and mixed realities, and with social features are listed as potential new service concepts. *Video service concepts* are a potential new area, depicting video-shopping and video-messaging. Such service concepts may be utilized foremost by different brands, who wish to engage their customers and strengthen interaction in order to increase purchase frequencies and/or expenditure. Opportunities lie both within B2C as well as B2B markets, as 5G enables dedicated networks for the use of different kinds of OTT service providers or local actors (e.g., shopping malls, restaurants).

Real-time services correspond to conveying information live (in real-time) using surfaces (digital signage) or in a live stream, with user generated content (influencers, bloggers, vloggers, business actors). Real-time language translation is also mentioned as a potential new service (e.g., in live video streams).

Finally, media content is heavily linked to advertising and market communication. 5G networks will allow for innovative advertising solutions, which convert into *advertising-based services* and *personalized services* for different target groups. As the consumer's digital media journey becomes more complex, AI and 5G offers opportunities for advertisers to target users with context-specific and congruent advertisements in real-time or as a response to media use patterns detected by AI in real-time. Advertisers are able to access data on media use and convert it into effective advertising, not only in terms of when and where to reach the target group, but also in terms of how to create an experience, engaging the target group representative and strengthening brand image, to name a few examples. In order for media actors to find viable business in the advertising domain, a deep understanding of consumers' digital journeys is required. Within the B2B domain, digital journeys and contact points are becoming even more important than before. Hence, advertising as a 5G-enabled service does not only relate to consumer markets.

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