New Business Models in the Media Sector and Convergence. Case study: Hyper360 Project

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Abstract. The media market is currently undergoing a major change as its traditional business models are shifting to digital products and services rapidly. Besides the prevalent digitization, this change is also driven by network advances and consumer behaviour. The introduction of non-linear content Over-The-Top (OTT), Video-On-Demand (VOD) has given consumers more control of their screen and the content they consume, making the business models always more user centric and increasing leaving the commercial broadcasters competing for their attention. In this work we will present the innovative business model for the media sector by providing the results of the Hyper360 project financed by the European Commission under the call ICT19. The Hyper360 project aims to use ICT technology and innovation exploiting the ongoing Virtual Reality revolution. The goal is to offer a complete end-to-end production toolset for enriched 360º video, with novel 3D storytelling elements, while also leveraging the powerful implicit preference extraction. The results of this project are expected to be achieved by the end of September 2020 and consist of end solution for 360-degree video production with enriched solution.

Keywords. Horizon2020, business model, 360-degree video, immersive technologies, ICT technology

1 Introduction

Due to rapid technological development the impact of such technological innovations on companies can be crucial and may request products, services, and operations adaptation (Yoo et al., 2012).

There are several factors that have a direct impact on the transformation of the business models in media companies.

- Internet adoption as a global multimedia platform. Thanks to converting the traditional way of sharing information to digital one a unified communication infrastructure that connects all activities in society change the way we communicate and consume data (van Dijk, 2006, Digital 2020: global digital overview, 2020). Moreover, a rapid development of technology enables media to have such features as multimedia, hypertextuality and interactivity. (van Dijk, 2006).
- Development of Information and Communication Technologies (ICT). ICT foster the business transformation and innovation in many companies. This is the case of media companies (Digital Economy and Society Index, 2020) This is the case media companies that started to operate more and

more in online environment by quickly and efficiently adopting the latest digital assets in their businesses.
- Consumer behavioural change. The audience uses a great number of devices that help to access multiple online media, websites, social media etc. This is an important issue for the business model transformation for media companies as audience change their habits in searching and consuming media products thanks to the technological devices through which such products are created and disseminated.
- Transformation of production and distribution of media products. Due to a technological development media professional learn to work with an enriched set of tools, to expand their qualification profile, and offer media content in new forms (Angova and Valchanov, 2018).

Both traditional and new media industries show their interest in immersive technologies (Kaplan-Rakowski and Meseberg, 2019). Moreover, there is a big choice of immersive technologies that can be exploit in new media business models such as Virtual Reality (VR), Augmented reality (AR), 360-degree videos, etc. An emerging technology that has the potential to change media companies in such a way is virtual reality (VR) (Gartner, 2016). Creating new business models in media sector is a dynamic process that is still under development and is just started to gain the interest of the scientific community. The new media age is bringing new sources of complexity. Media convergence is driving this evolution, and the changes will prove crucial for this sector. In this study we will demonstrate an example of new technological proposition as an example of the traditional media business transformation giving an insight into the latest technologies developed in the sector thanks to the investments provided by the European Commission that funded the Hyper360 (Enriching 360 media with 3D storytelling and personalisation elements) under the call H2020-ICT-2016. This study provides practical example of the media sector convergence lead by new business model adoption.

2 State of the art

2.1 Immersive technologies for the media content production

The Immersive Experience is described by Gartner as VR, AR and mixed reality (MR) and defined as technologies that are "changing the way in which people perceive the digital world." Gartner foresees that 70 % of enterprises will use immersive technologies for consumer and enterprise use by 2022, when 25 % in its turn will be used for production.[1]

The virtual reality content creation tools are widely used to create immersive experience content. The adoption of virtual reality content creation is expected to rise in the nearest future. The constant increase in demand of such HMDs as VR and AR over the world and great presence of VR devices in such sectors as gaming and entertainment enable a fast growth in the global virtual reality content creation market.

[1] Gartner Top 10 Strategic Technology Trends for 2019
https://www.gartner.com/smarterwithgartner/gartnerZtopZ10ZstrategicZtechnologyZtrendsZfor Z 2019/

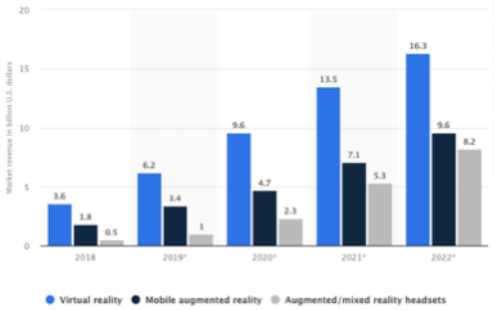

Fig. 1. Immersive technology consumer market revenue worldwide from 2018 to 2022, by segments (in billion U.S. dollars) (source: Statista 2020)

Moreover, marketing sector experiences the increased demand of VR content in order to provide more personalized and immersive marketing customer experience.
What is the relation between 360-degree video and immersive VR in new media content production? 360 videos are the principle of the immersive VR production. The most benefits are that it is quite simple to produce 360-degree videos as there are always more affordable 360 video cameras available on the market that makes it easy and quick for producing media content. However, the commercial potential of 360 videos is still quite limited and many technology companies address the media companies to produce the content. As long as there is no magnetizable market, the media companies will most probably continue the collaboration in form of pilot projects in order to find the best ways to produce, distribute, and monetize 360 video content[2].
TV broadcasters started to apply immersive videos to their content. Immersive content produced by the media companies may vary from the documentary type of content with high production values that run up to 20 minutes long, and is delivered via apps to headsets or short (sub-two-minute) clips intended for the magic window or browser viewing on smartphones and distributed on social media channels.

2.2 Application of the immersive technologies by European broadcasters

European public broadcasters are taking into consideration the opportunity to produce 360 videos and VR content to improve their business proposition. The main interest of many media broadcasters is to test various technologies and learn of their potential and opportunities (VR/AR Market report). Despite the fact that new immersive technologies can bring benefits to the content creation, broadcasters do not hurry to use such tools also due to the budget constrains for VR/AR content production. Only some big commercial broadcasters are investing into VR and 360 video content.
VR or 360 video productions is often seen as a tool for marketing promotion and different events such as sport games and concerts. Media companies start to realize that VR content should be a solid unique proposition and not only ad added value to a core business. This is a big issue for the further development in the VR/360 video content.

[2] VR/AR Market Report http://www.digitalmedia.fi/wp-content/uploads/2018/02/DMF_VR_report_edit_180124.pdf

Moreover, the companies may lack of financial or other type of resources to produce such kind of content. That is why new affordable technological solutions are required to solve these problems.

3 Methodology

In order to contribute to the knowledge creation about new business models in the media sector we choose the case study methodology that will provide the insights in the new technological advancements that may revolutionize the business models in the media sector. In more details we will describe the tools developed by Hyper360 project that was financed by the European Commission. that will revolutionize 360-degree video content production.

4 Case study: Hyper360

Hyper360 (Enriching 360 media with 3D storytelling and personalisation elements) is a European research and development project that has been funded by the European Union under the call Horizon2020 ICT-2016 «Media and Convergence». The main targets of the project are the content creators such as media companies and broadcasters.

Hyper360's goal is to offer a complete end-to-end production toolset for enriched 360° video, with novel 3D storytelling elements, while also leveraging the powerful implicit preference extraction means that omnidirectional viewing offers, i.e. the viewing direction, to build a personalization framework on top of the consumption of this new hybrid format.

Hyper360 value proposition is present in figure below.

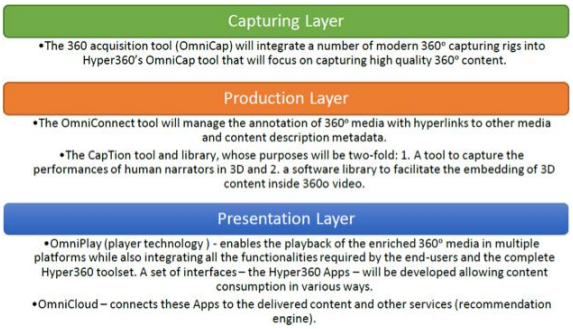

Fig. 2. Hyper360 Toolset

4.1 Hyper360 Tools

OmniCap

OmniCap tool integrates multiple components in order to provide a powerful and feature-rich tool. OmniCap consists of: Core capturing, Quality Check and The tracking and object detection.

Core capturing. Core capturing is a tool responsible for capturing of 360° video. It supports various capturing rig types and cameras, life-based stitching and safe zones. The OmniCap capture suite solution was designed with the purpose of managing multiple 360 and mixed camera types for professional productions. It employs Broadcast Hardware and pipeline (4K resolution, 3D stereoscopic capture, Black Magic Design MultiView Units and SDI+Ethernet camera connectivity) to manage up to 36 cameras simultaneously placed on a set.

Q**uality check.** This tool is responsible for the quality check of the 360° content and has been integrated in both OmniCap and OmniConnect tool. It detects a variety of defects commonly occurring in 360° video like blurriness, signal clipping, noise, flicker and several others. The quality check component reports about the detected defects to the user in a separate application

Tracking and object detection. This component provides functionality for tracking a user-defined template and for detecting and tracking automatically salient objects (persons, cars etc.) in the scene. The single-object tracker is useful for tracking user-defined regions, such as hotspots, automatically throughout the 360° video.

CapTion

The CapTion toolkit is a set of tools for mixed immersive media productions that combine two forms of next-generation free-viewpoint video formats, namely, omnidirectional (360°) video and 3D media. Starting from a multi-sensor capturing studio, presented in Figure 3, where spatially and temporally aligned RGB-D videos are recorded.

Fig. 3. The volumetric capture studio that allows for the multi-view calibration and synchronization of multiple RGB-D sensors

The performance of a user is captured and produced as a dynamic textured mesh, as showcased in Figure 4. The 3D content will be merged within the 360° media through the fusion post-production tool.

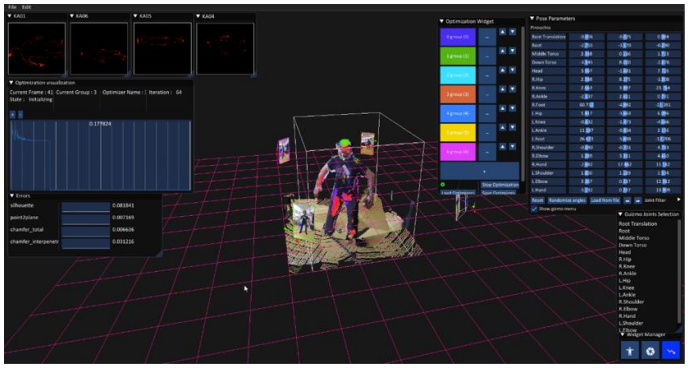

Fig. 4. The 3D performance capture production tool that uses multi-view RGB-D video recordings and produces a dynamic textured mesh by fitting a template model within the performance of the users

OmniConnect

OmniConnect offers many features to enrich 360° videos with different types of hotspots such as shapes, 2D videos, audio fragments, html pages, multiline texts, images and metadata. To do that OmniConnect proposes a user-friendly web interface compatible with any browser supporting the HTML5 and WebGL standards. The 360° video annotation process interacts with the Omnicloud data layer to store all hotspot properties and associated events. In addition to that, OmniConnect also offers the possibility to publish the enriched 360° video file by specifying one or more target device classes (iOS, Android, PC, and HDMI).

Profiling Engine

User profiling in Hyper360 is based primarily on the use of implicit feedback, in order to allow seamless personalised content delivery. Without requiring any manual effort on their side, the user's state of immersion and engagement is further heightened through an experience that is more relevant to their preferences. Pivotal to an effective implicit personalisation strategy is the use of 360° videos. While traditional, fixed perspective video offers little to no insight as to what viewers are looking at, free viewpoint video offers the unique opportunity to recognise areas of interest and disinterest.

Automatic camera path

The goal of automatic camera path generation (automatic cinematography) is to automatically calculate a visually interesting camera path from a 360° video, in order to provide a traditional TV-like consumption experience. An initial prototype of the automatic camera path generator was researched and developed, which is mainly based on the information about the scene objects (delivered from the object detection and tracking algorithm). For each scene object, a saliency score is calculated based on

several influence factors (object class and size, motion magnitude, visited map, neighbours of object), which indicates the “interestingness” of the object.

Fig. 5. Visualisation of the result of the automatic camera path for a music video

Recommendation Engine

Hyper360’s Recommendation Engine drives the decisions as per the content that better matches each viewer’s preferences and provides related media recommendations. Recommendation is based on semantic matching between user profiles and content metadata.

Semantic content interpreter

In order to have a holistic representation of content metadata and subsequently on the user preferences which are implicitly learned based on the metadata of the content that the user has consumed, and minimize loss of information, content metadata are semantically interpreted into a set of fuzzy ontology-based concepts and axioms. This interpretation is based on learned lexico-syntactic relations between metadata, with a method that supports domain-specific re-training based on the Hyper360 viewers’ community consumed metadata patterns.

Fig. 6. Semantic interpretation sample

Omniplay
OmniPlay is a suite of cross-platform application prototypes implemented on different platforms while adhering to the specific characteristics and requirements of those platforms. Each of these Apps is based on a set of services offered by the underlying operating system, where both HW performance, SW limitations on video playback and device User Interaction possibilities need to be considered separately for each case.

4.2 Hyper360 pilots

The user partners in the Hyper360 project, the broadcasters Rundfunk Berlin-Brandenburg (RBB) and Mediaset RTI, employed the first prototypes of the developed tools in order to produce pilot content. For this, RBB focused on the Immersive Journalism scenario, which allows first person experience of the events or situations described in news reports and documentary film. The focus of RTI was on the Targeted Advertising scenario, where entertainment or infotainment content is enriched with advertising objects and hyperlinks. For both scenarios, first concepts for potential pilots have been developed during joint workshops with the broadcasters production department.

5 Discussion

Some broadcast players have demonstrated a great interest in immersive technologies and have already applied them[1]. VR sport experience: the users can experience high quality VR sports video, which provides an immersive participation experience. For instance, for the first time ever NBC provided 85 hours of VR Olympics content summer 2016. VR events experience: in this case the users may take part in music, conference, festival or any other kind of event by watching 360º video via VR device. Hyper360 toolset showed to be of a great interest both for professional content producers and end users. Broadcasters Mediaset RTI and RBB organized Toolset assessment in order to test the tools usability and acceptance both by media professionals and end users. During the assessment phase the test groups had a chance to test the tools and provide their feedback. At the end of the assessment Hyper360 team received the positive feedback from both groups that confirms that traditional media will have to face the digital transfortation in order to satisfy the modern audience.

6 Conclusions

Business model innovation goes together with the digital transformation and convergence. Fully immersive video offers a great opportunity for the telecommunication sector, broadcasters, sports. Media companies have demonstrated an interest in exploring the opportunities that immersive technologies such as VR, AR, 360 video offer as demonstrated in this study.
This work presented the unique value proposition developed by Hyper360 project on tools for capturing, production, enhancement, delivery and consumption of enriched 360 video content. Such tools that were developed by Hyper360 project and described in this work will revolutionize and transform the business models of the media companies enabling more personalized and immersive media content.

Acknowledgments
This work has received funding from the European Union's Horizon 2020 research and

[1] VR broadcasting: Still a long way to go? - https://www.ibc.org/tech-advances/vr-broadcastingstill-a-long-way-to-go/2389.article

innovation programme, grant n761934, Hyper360 (“Enriching 360 media with 3D storytelling and personalisation elements”).

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