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EXPLORING THE IMPACTS OF VIRTUAL REALITY ON BUSINESS MODELS: THE CASE OF THE MEDIA INDUSTRY

Joschka Mütterlein
Ludwig-Maximilians-Universität München, muetterlein@bwl.lmu.de

Thomas Hess
Ludwig-Maximilians-Universitat Munchen, thess@bwl.lmu.de

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Mütterlein, Joschka, Ludwig-Maximilians-Universität München, Munich, Germany, muetterlein@bwl.lmu.de

Hess, Thomas, Ludwig-Maximilians-Universität München, Munich, Germany, thess@bwl.lmu.de

Abstract

Virtual reality (VR) is an emerging technology with a large potential to disrupt businesses. However, impacts of VR on companies have remained largely unexplored. We seek to fill this research gap with the business model concept as a well-structured foundation. Using the example of the media industry as one of the industries most affected by VR, our qualitative study classifies different types of VR applications and contents to assess their impacts on a business model's components. We distinguish between the internal use of VR applications in companies (e.g., for conferencing and collaborating) and the production and distribution of VR content for external use (e.g., videos and games). The findings show that the impact of VR on companies that produce and distribute VR contents for external purposes is large and even increases when more technologies are needed to create content and when the content is more interactive. Compared to this, VR's impact on companies that merely use the technology for internal purposes is small. Our analysis also shows that the business model concept is well suited to analyze technology adoption at the firm level. Thus, we suggest its future use to methodically advance this research stream.

Keywords: Virtual Reality, Business Model, Firm-Level Adoption, Media Industry.

1 Introduction

Technological innovations can have tremendous impact on firms and can make it necessary to adapt products, services, and operations (Yoo et al., 2012). An emerging technology that has the potential to change companies in such a way is virtual reality (VR) (Gartner, 2016). It was predicted to create a billion dollar market already in 2016 and is said to disrupt many industries in the long term, starting with media (Deloitte, 2016). This raises questions about the technology's impacts on companies – products, services, processes, or structures might need to be adapted, some even drastically. While the development of VR has been rapid in the past years (Anthes, 2016), research has not followed suit by providing answers to questions on how the technology affects companies, although an agenda for IS research on VR was presented early on (Walsh and Pawlowski, 2002).

To fill this research gap, we analyze the impacts of VR on companies. As any company is a complex construct, such impacts can be multifaceted and hard to grasp. Thus, we need a foundation that allows one to analyze a company as comprehensively and systematically as possible. The business model concept provides an ideal basis for this, because it is capable of describing the rationale of how companies do business in a well laid out structure and allows to assess changes of that rationale holistically (Wirtz el al., 2016). As an object of investigation, we chose the media industry, since it is the industry most affected by the technology. Similar to marketing and commerce, media companies experience such effects in two ways: first, VR applications can be used internally (USE), e.g., VR applications that create virtual rooms for conferencing and collaborating. Second, VR content can be produced and

distributed for external use (P&D), e.g., videos and games. Our research question is: How do VR USE and VR P&D affect media companies' business models?

Focusing on a single, ideal industry type decreases the generalizability of results. Yet, at this exploratory stage, our approach is a valuable foundation for theory-building (Bacharach, 1989). In this sense, our work can serve as a stepping stone for research in four directions: First, we offer a theoretically derived classification of VR applications and content that can be used to systematically investigate VR in future studies. Second, our results are directly applicable to practice and research interested in the impacts of implementing VR in areas concerned with content creation, i.e., media management, marketing, and commerce. Third, we provide a foundation for further research on the impacts of VR in other industries, enabling comparisons with our case. Fourth, we demonstrate that the business model concept is an interesting foundation for comprehensive evaluations of the consequences of technology adoption at the firm level.

2 Theoretical Foundations

2.1 Virtual reality

Although attention on VR, defined as "a real or simulated environment in which a perceiver experiences telepresence" (Steuer, 1992, p. 76f.), has increased tremendously since the introduction of the Oculus Rift in 2012 on the crowdfunding platform Kickstarter, the concept is far from new. After earlier fictional works, Sutherland (1965) was the first to present a scientific vision of an "ultimate display" in the 1960s. In the following decades, VR became a mainly fictional subject again, until Rheingold (1991) among others renewed scientific interest. The 1990s saw the first VR hype, accompanied by many issues regarding the definition and precise manifestation of the technology (Biocca et al., 1995). Owing to the limited technological possibilities at the time, VR soon became a niche topic again, but today's technologies have finally enabled mass market use (Anthes et al., 2016).

Along with the overall interest in VR, the question how it would change businesses has also long been clear (Rheingold, 1991). An IS research agenda on VR that covers management issues was formulated early on (Walsh and Pawlowski, 2002), but little has happened in that direction since. IS research has delved into topics such as customer perceptions of VR in commerce (e.g., Suh and Lee, 2005) and, in a very wide VR sense, team collaboration in virtual worlds (e.g., Davis et al., 2009) and organizational learning in virtual worlds (e.g., Dodgson et al., 2013; Li et al., 2011). However, to date the business model impacts of implementing VR have remained unexplored.

2.2 Business models

Technological innovations, namely e-businesses, have been linked to the business model concept since its early days (Amit and Zott, 2001). A business model "describes the rationale of how an organization creates, delivers, and captures value" (Osterwalder and Pigneur, 2010, p. 14) and covers the important areas of a company. The definitions of what constitutes a business model have developed rapidly, with the Business Model Canvas (Osterwalder and Pigneur, 2010) being the most popular and widely used framework in practice. In research, business model design, analysis, and change are frequent topics (e.g., Johnson et al., 2008; Wei et al., 2014; Zott and Amit, 2010). This has led to a variety of frameworks, one of the most recent and comprehensive stemming from Wirtz et al. (2016). They combine earlier works from practice and research into a framework that categorizes the business model of companies along nine fields. These are the strategy, resources, network, customer, market offer, revenue, manufacturing, procurement, and financial models. As this framework encompasses most previously suggested business model components, it is best capable of analyzing a business holistically and, thus, the most suitable framework for our research.

Regarding the effects of new technologies on business models, little research exists. Previous studies have analyzed the roles of business models in capturing value from novel technologies (Chesbrough and Rosenbloom, 2002), identified optimal business models when technological innovations arise (Pateli and Giaglis, 2005), and studied how technology-driven business models can be adapted better (Lee et al., 2013). Yet, the effects of new technologies on business model components remain largely unexplored, especially concerning VR, although the impact of new technologies on companies can be large (Melville et al., 2004).

The two ways in which VR can affect business models can also be seen as technology adoption at the firm level (Oliveira and Martins, 2011). Regarding USE, companies must adopt VR directly. Regarding P&D, companies must adopt specific technologies to produce and distribute VR content, which resembles an indirect form of VR adoption. Yet, while technology adoption at the firm level is a popular research stream, it has provided no frameworks that are comprehensive enough to investigate how the ways companies do business are affected when a new technology is introduced. The theory of the diffusion of innovations (Rogers, 1995) or the technology-organization-environment framework (DePietro et al., 1990) are the most popular foundations. However, these and other adoption models are mainly used to evaluate antecedents of technology adoption by firms (e.g., Benlian et al., 2009; Low et al., 2011), but not consequences. The latter have been subject to research in an individual consumer context (e.g., Agarwal and Prasad, 1998; Trenz et al., 2013), but have remained largely unexplored in company contexts (Ordanini, 2006; Saeed and Abdinnour, 2011). While single studies exist, they provide no comprehensive framework that allows to systematically evaluate the impact of technology adoption (e.g., Gangwar et al., 2014; Iacovou et al., 1995). Thus, the business model concept is a more appropriate foundation concerning our research question, and has also recently been shown to provide relevant insights in related IS research (Berger and Hess, 2015).

3 Method

Previous research on business models indicates that business model transformations, as is the case here with transformations owing to technological pressures from outside of the firm's boundaries, are well assessable via qualitative case studies (Berger and Hess, 2015; Wirtz, 2016). As there are few previous findings that we could transfer to the context at hand, we chose to also answer our research question in an explorative, qualitative way with semi-structured interviews and multiple cases (Benbasat et al., 1987). The process consists of four steps. We address the first three in this research-in-progress paper:

1. Classification of VR applications and content: we needed to develop a technology-interaction-based classification of VR applications and content to provide a foundation for interviews. Such a classification is also essential because technological requirements regarding applications and content determine which technologies a company must adopt for P&R or USE.
2. Interview guideline and initial interviews: we developed an interview guideline that covers assurance of anonymity, project background information and definitions, and questions regarding the status quo and impacts of VR on each of the business model components. We conducted five interviews with media practitioners (one from film/TV, size "large", one from radio/music, size "medium", one from newspaper, size "large", and two from gaming, sizes "small" and "medium", see detailed selection criteria for cases below) to get a broad picture of VR's impacts.
3. Analysis and triangulation of data: we transcribed, coded, and triangulated the five interviews as described below. Based on the results, we adapted the questionnaire to ensure that we cover all areas in detail.
4. Completion of interviews: we will use the same adapted guideline for the following interviews with practitioners who best complement our initial sample (Paré, 2004).

To carefully address the media industry as our object of investigation in breadth, we divided our sample in the sub-industries film/TV, cinema, gaming, radio/music, publishing, newspaper, and infrastructure/distribution. For each of these sub-industries we selected three exemplary companies based on size and experience with VR. We assessed experience with VR via VR products released by the company and size via number of employees, i.e., small is fewer than 50 employees, medium 50 to fewer than 250 employees, and large with 250 employees or more (European Union, 2003). The main criterion for our choice of interviewees was insight into technology usage and business processes, i.e., a company's CEO, production manager, or employees responsible for creating VR products. After completing the initial five interviews that are included in this research-in-progress paper, we scheduled another 16 interviews to cover the media industry in breadth.

All interviews were recorded on tape and transcribed. One researcher then coded the interviews regarding the effects found and regarding an estimation of the technology's impacts. The latter could be low, medium, or high, based on a comparison of the business model components' status quo and the effects of VR USE and P&D, as reported by each interviewee. Another researcher coded the interviews again, without seeing the results of the first researcher. If their coding differed, a third researcher coded the respective paragraph independently from the two others and the majority vote decided on the final coding. For the first five interviews, this procedure led to an intercoder reliability of 0.87 regarding effects found and 0.94 regarding the estimation of technology's impacts, indicating good agreement on the results (Neuendorf, 2017). In the rare case of three differing opinions, the paragraph and all three codings were given to a fourth researcher, who made the final decision. To further increase the quality of our work, we followed guidelines from IS research and other disciplines, e.g., regarding documentation (Dubé and Paré, 2003; Mayring, 2014; Paré, 2004).

Finally, we triangulated our findings using presentations and posters from four events attended in October and November 2016: Medientage München, one of Europe's largest annual media conventions, as well as the symposia on media innovations at the University of Oslo, on radio innovations at University of Cologne, and on VR software and technology at the Technical University of Munich. All of these addressed media innovations generally or VR specifically, with either a focus on technological or business aspects from either a practitioner or an academic perspective, or both. We obtained information from 228 presentations and posters, with 42.11% (n = 96) focusing at least partially on VR. We recorded presentations that were not available as papers or posters either as video or audio files in full length to ensure a systematic analysis and quality of triangulation (Yin, 2014).

4 Preliminary Results and Discussion

4.1 Step 1: classification of virtual reality applications and content

As no suitable classification of VR applications and content existed, we conducted a thorough literature review and built our classification on the established, broad definition of Steuer (1992) as noted above. However, to connect content to technology, we followed Biocca and Delaney (1995) in focusing on the underlying technology: VR is "the sum of the hardware and software systems that seek to perfect an all-inclusive, immersive, sensory illusion of being present in another environment" (p. 63). We also followed Anthes et al. (2016), who suggest restricting the underlying technology's scope to developments that are currently relevant for end-consumers, which excludes spatially immersive devices and other projection-based technologies such as CAVE installations. Finally, such technologically delivered VR applications and content must enable interaction (Burdea and Coiffet, 2003), at least to an extent that users can move their field of vision 360 degrees.

The result is a technology-interaction-based classification of VR applications and content as a continuum ranging from low-VR types, such as passively viewed 360-degree videos merely consumed via visual displays, to high-VR types, such as actively played VR games consumed via binaural audio and visual, haptic, and even multisensory displays (Anthes et al., 2016). Figure 1 shows the full continu-

um. The five boxes in the figure exemplify how the classification can be used to order different VR content types according to the underlying technologies. However, the classification can also be used to classify business and social VR applications for conferencing, collaboration, and learning. The numbers represent (with illustrative examples):

1. 360-degree video with one fixed camera (sports video),
2. video with binaural audio and several cameras that can be chosen (classical music concert),
3. game with binaural audio on a display with integrated touchpad (simulation game),
4. game with binaural audio, external controller, and haptic suit (adventure game),
5. game with binaural audio, external controller, haptic suit, and multisensory mask (action game).

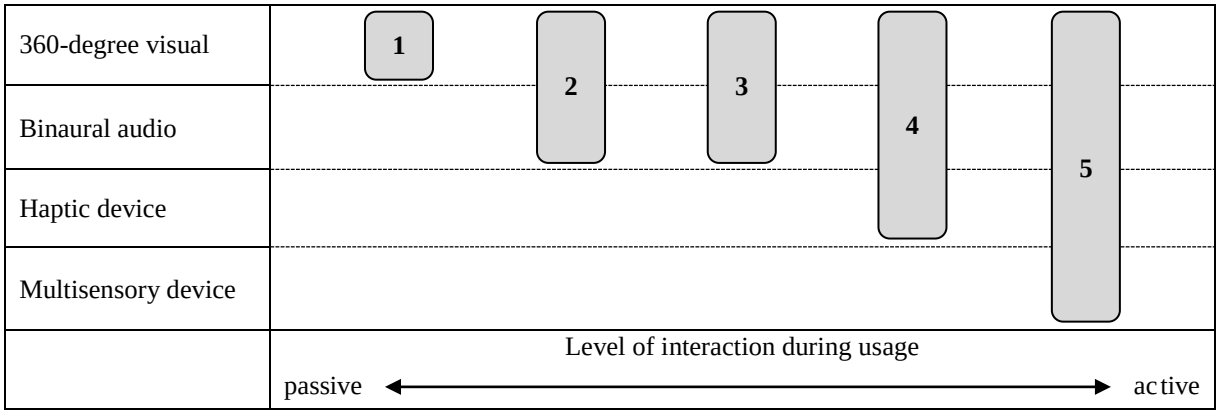

Figure 1. Technology-interaction-based classification of VR applications and content.

4.2 Steps 2 and 3: first insights into the impacts of virtual reality adoption

The aggregated interview results of this research-in-progress paper are shown in Table 1. Our findings are divided into the affected business model component, with a quote that represents the overall opinion from the interviews. To illustrate changes, Table 1 contains the status quo as well as the effect for each component. As can be seen, some descriptions relate to low-VR content (as per our classification above), other descriptions relate to higher-VR content. With the two dimensions of our classification, (i.e., underlying technology and level of interaction), Table 1 highlights that the more underlying technologies are needed and the more interactive the content is, the larger the impact. To assess this impact on each component, we distinguish between effects regarding P&D and effects regarding USE. However, qualitative research is generally unable to display all results in their full length. Thus, we made a selection of all effects that is as objective as possible by focusing on the issues mentioned most often.

Business model component (impact)	**Status quo regarding VR production & distribution (P&D) or usage (USE)**	**Effects of VR adoption regarding production & distribution (P&D) or usage (USE)**
Strategy model (P&D: low) (USE: low)	(P&D/USE:) Doubts about the ideal integration of new technologies	(P&D/USE:) Doubts about the ideal integration of VR
	"I'm not sure if it will really work […] a few years ago, we thought 3-D would be the next big thing […] only to realize it's more for cinemas, for an event feeling."	
Resources model (P&D: high)	(P&D:) Usage of editors and content management systems that can be handled without programming knowledge	(P&D:) Usage of game engines that need programming knowledge to handle increasing requirements of higher-interaction content
	"We develop using the Unreal engine, [which is] well known in the gaming industry."	

Network model (P&D: medium)	(P&D:) Network of different specialists needed, emphasis on distribution partners	(P&D:) Network of different specialists needed, emphasis on production and distribution partners
	"I prefer to work with strong networks and to get specialists for the various tasks."	
	(USE:) Remote collaborations and meetings per email, phone, and video	(USE:) Remote collaborations and meetings become face-to-face in VR
	"You can have most of the advantages of real conferences without needing to travel."	
Customer model (P&D: high) (USE: medium)	(P&D:) Data handling is not an issue, except for streaming or 3-D/4K films	(P&D:) From production to distribution, large amounts of data need to be handled
	"You need engines to reduce the amounts of data you need to bring to the display. This is a technological obstacle."	
	(USE:) Content length is variable, few restraints when content is interesting	(USE:) Content length is restricted by hardware
	"The user experience is much shorter […] we do not want to force people to wear a display for one and a half-hour."	
Market offer model (P&D: medium)	(P&D:) Mostly established old and new media competitors	(P&D:) Competitors from other industries, often technology-based, enter the market
	"[Competitors] differ. Many have an agency background, […] a technology background, […] small and fast units."	
Revenue model (P&D: medium)	(P&D:) Clear revenue models for most media, a little less clear for online news	(P&D:) Revenue models for entertainment and information content are unclear
	"I don't think there will be something specific for VR, but something that's already there in other areas."	
Manufacturing model (P&D: high) (USE: low)	(P&D:) Traditional production structures to create one specific content type and to foster creativity, trend to be more flexible	(P&D:) Production structures fundamentally change so as to embrace technological expertise besides creativity, making content development similar to the development of games
	"To implement VR in our infrastructure, from the digital side, was the most difficult for me. This has worked well in some areas and not at all in many others."	
	(USE:) Prototyping is conceptually at an early stage, creating and discussing a real prototype requires effort	(USE:) Prototyping is easier when a team can meet and discuss a virtual prototype in VR
	"Teams can see the full results of their work and adapt and evaluate much faster."	
Procurement model (P&D: medium)	(P&D:) Few physical requirements of consumers regarding the content	(P&D:) Information from other fields are necessary (e.g., medicine and psychology)
	"I'm not convinced about moving around [in VR]. First, there is the motion sickness problem that many people still experience. Second, I need to move in a world and not feel pushed around. It must seem homogeneous."	
Financial model (P&D: low)	(P&D:) Longer investment cycles	(P&D:) Repeated, short-term investments are necessary
	"We have bought a few cameras […] and we're now waiting for the next generation, because buying the old camera again makes no sense, because it is outdated within two months […] the technological rhythm is becoming faster and faster."	

Table 1. Status quo and effects of VR adoption on media business models.

Comparing P&D to the status quo, we found high impacts on the resources, customers, and manufacturing models. This is reflected in the changes of processes and structures in production and distribution. Only low-VR-content, such as passively viewed 360-degree videos, requires little adaption. This is highlighted by one interviewee, who stated: "If you just do 360-degree videos, many things are

similar." However, processing even this content gets more complex, as an interviewee explained: "Of course, there are many additional steps in post-production." But when the content's interaction level increases (see Figure 1) and growing amounts of visual, audio, haptic, or even multisensory data must be created for (manufacturing model) and processed to the users (customer model), suitable engines, digital resources (resources model), and new processes and structures (manufacturing model) are required. Other business model components are also affected by VR P&D, but to a lesser extent.

This shift can also be seen at the individual level, where job tasks are changing. For instance, our triangulation data included a panel discussion that widely agreed with a participant explaining that "besides my job in TV, I have experience in interactive media and game design, which help me with VR [...] 360 degrees is linear video content, little interaction [...] as soon as it comes to real VR, the author is more of a level designer and the story is more of an experience." As this example demonstrates, the higher the level of interaction, the more creating VR content resembles game production – a business type many media companies have little experience in. This finding is confirmed by our interviewees from the gaming sub-industry. They were the only ones to report being less affected, as they have already integrated many of the abovementioned aspects into their business models and work with technologies that can cope with most of the stated problems. Other sub-industries face bigger challenges. Our findings indicate that, at the least, they must acquire technological expertise and adapt their production and distribution. At the most, they must enter previously unknown market areas. This is especially apparent in radio/music, which arguably must re-invent their role in a virtual environment.

Regarding USE in organizations, VR's impacts seem almost negligible. Few business model components are affected, such as the manufacturing or the network model, and for those, VR has only low to medium impacts. Our interviewees underlined that VR use might improve work for some employees and departments, but the general business model seems to remain unchanged.

5 Current Implications for Research and Practice

For research, our work extends previous studies on VR and virtual worlds to a broader company context (e.g., Davis et al., 2009; Suh and Lee, 2005). It offers a broad foundation that enables one to further analyze VR use in firms, which has been an underexplored area for many years (Walsh and Pawlowski, 2002). To deepen understanding, our paper should be extended in future research with in-depth case studies of media companies and companies from other industries that already make substantial use of VR technology.

Besides the direct business impact, our findings raise questions about consumers' views on VR. First, to evaluate how urgent the need to adapt business models is, it is necessary to investigate if consumers really want to use VR on a sustained basis. Further, our interviewees have been astonishingly vague concerning revenue streams. For instance, besides the abovementioned quote from an interview, our triangulation data contain a speaker joking that, for VR, "the perfect financing methods are currently being worked on". Such quotes show how unclear revenue generation with VR content is. Thus, to be able to discuss possible impacts of VR on revenue models, it is necessary to explore consumers' willingness to pay for VR content to establish a sound foundation for discussion. Both questions, i.e., about continuance intention and willingness to pay for content, require a comprehensive investigation of the possible variables that influence them.

In this study, we also demonstrated that the business model concept is well suited to investigate the consequences of technology adoption at the firm level, because it provides a well-structured and comprehensive framework. Only technological and environmental aspects might be covered in more depth. Integrating the concept into the technology-organization-environment framework (DePietro et al., 1990) would most likely further increase the quality of analysis, and is a logical avenue for future research. The resulting approach could then be used to analyze organizational technology adoption and improve the analyses of business models that focus on technological aspects (e.g., Pateli and Giaglis,

2005). Such an approach could also employ insights into the quantitative assessment of changing business models (Clauss, 2016).

For practice, our findings highlight how crucial it is for companies and departments involved with media to get technological expertise and to not rely on the mostly creative capabilities needed for producing non-interactive traditional, web, or mobile content. VR P&D makes it necessary to use the skills of game developers or, if gamification aspects are not needed, other programmers, in order to produce interactive content. At a firm level, processing and distributing VR content requires processes and structures similar to that of gaming companies, for instance, agile development, rapid prototyping and user tests, real-time handling of large amounts of data, and long-term improvement of content with patches. This is also true for marketing and commerce, which need the same kind of expertise for VR content production and distribution as media companies.

6 Conclusion and Future Research

We have used the business model concept to analyze the impacts of VR on media companies' business models. Our findings show that the impacts on companies that focus on P&D is large and even increases when more technologies are needed to create content and when the content becomes more interactive. Mainly due to the changing requirements regarding the business model's resources, customer, and manufacturing components, these companies must orient themselves towards the business models of game companies. Compared to this, VR's impact on companies that merely focus on USE (e.g., for conferencing and collaborating) is small.

In addition, we have provided a classification of VR applications and content and have demonstrated that the business model is well suited to analyze the consequences of technology adoption at the firm level. Based on this, we have recommended further research on how it can be combined with the established technology-environment-organization framework (DePietro et al., 1990). Further, we have suggested research concerning VR's impacts on companies and concerning consumers' attitudes towards VR content. This research-in-progress paper will be completed with step 4 – including the pending interviews and adapting findings. Based on our data used for triangulation, we assume that these interviews will add more facets, especially concerning sub-industries, and that they will confirm our overall picture and conclusions: when it comes to P&D, VR will most likely make it necessary for companies to adapt their products, services, and operations.

References

Agarwal, R. and J. Prasad (1998). "The antecedents and consequents of user perceptions in information technology adoption." *Decision Support Systems* 22 (1), 15–29.

Amit, R. and C. Zott (2001). "Value creation in e-business." *Strategic Management Journal* 22 (6–7), 493–520.

Anthes, C., R. J. García-Hernández, M. Wiedemann and D. Kranzlmüller (2016). "State of the art of virtual reality technology." In: *Proceedings of the IEEE Aerospace Conference*, Big Sky, MT, March 2016.

Bacharach, S. B. (1989). "Organizational theories: Some criteria for evaluation." *Academy of Management Review* 14 (4), 496–515.

Benbasat, I., D. K. Goldstein and M. Mead (1987). "The case research strategy in studies of information systems." *MIS Quarterly* 11 (3), 369–386.

Benlian, A., T. Hess and P. Buxmann (2011). "Drivers of SaaS-adoption – An empirical study of different application types." *Business & Information Systems Engineering* 1 (5), 357–369.

Berger, B. and T. Hess (2015). "The convergence of content and commerce: Exploring a new type of business model." In: *Proceedings of the 21st Americas Conference of Information Systems (AMCIS)*, Puerto Rico, August 2015.

Biocca, F. and B. Delaney (1995). "Immersive virtual reality technology." In: *Communication in the age of virtual reality*. Ed. by Biocca, F. and M. R. Levy. Hillsdale, NJ: Lawrence Erlbaum, pp. 57–124.

Biocca, F., T. Kim and M. Levy (1995). "The vision of virtual reality." In: *Communication in the age of virtual reality*. Ed. by Biocca, F. and M. R. Levy. Hillsdale, NJ: Lawrence Erlbaum, pp. 3–15.

Burdea, G. C. and P. Coiffet (2003). *Virtual reality technology*. 2nd Edition. Hoboken, NJ: John Wiley & Sons.

Clauss, T. (2016). "Measuring business model innovation: Conceptualization, scale development, and proof of performance." *R&D Management*, doi:10.1111/radm.12186.

Chesbrough, H. and R. S. Rosenbloom (2002). "The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spin-off companies." *Industrial and Corporate Change* 11 (3), 529–555.

Davis, A., J. Murphy, D. Owens, D. Khazanchi and I. Zigurs (2009). "Avatars, people, and virtual worlds: Foundations for research in metaverses." *Journal of the Association for Information Systems* 10 (2), 90–117.

Deloitte (2016). *Virtual reality: A billion dollar niche*. Prediction. Deloitte Touche Tohmatsu Limited.

DePietro, R., E. Wiarda and M. Fleischer (1990). "The context for change: Organization, technology and environment." In: *The processes of technological innovation*. Ed. by Tornatzky, L. G. and M. Fleischer. Lexington, MA: Lexington Books, pp. 151–175.

Dodgson, M., D. M. Gann and N. Phillips (2013). "Organizational learning and the technology of foolishness: The case of virtual worlds at IBM." *Organization Science* 24 (5), 1358–1376.

Dubé, L. and G. Paré (2003). "Rigor in information systems positivist case research: Current practices, trends, and recommendations." *MIS Quarterly* 27 (4), 597–635.

European Union (2003). "Commission recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises." *Official Journal of the European Union* 46 (L124), 36–41.

Gangwar, H., H. Date and A. D. Root (2014). "Review on IT adoption: Insights from recent technologies." *Journal of Enterprise Information Management* 27 (4), 488–502.

Gartner (2016). *Hype cycle for emerging technologies, 2016*. Report. Gartner, Inc.

Iacovou, C. L., I. Benbasat and A. S. Dexter (1995). "Electronic data interchange and small organizations: Adoption and impact of technology." *MIS Quarterly* 19 (4), 465–485.

Johnson, M. W., C. M. Christensen and H. Kagermann (2008). "Reinventing your business model." *Harvard Business Review* 86 (12), 50–59.

Lee, C., H. Park and Y. Park (2013). "Keeping abreast of technology-driven business model evolution: A dynamic patent analysis approach." *Technology Analysis & Strategic Management* 25 (5), 487–505.

Li, J., D. D'Souza and Y. Du (2011). "Exploring the contribution of virtual worlds to learning in organizations." *Human Resource Development Review* 10 (3), 264–285.

Low, C., Y. Chen and M. Wu (2011). "Understanding the determinants of cloud computing adoption." *Industrial Management & Data Systems* 111 (7), 1006–1023.

Mayring, P. (2014). *Qualitative content analysis: Theoretical foundation, basic procedures and software solution*. Klagenfurt: self-published.

Melville, N., K. Kraemer and V. Gurbaxani (2004). "Review: Information technology and organizational performance: An integrative model of IT business value." *MIS Quarterly* 28 (2), 283–322.

Neuendorf, K. A (2017). *The content analysis guidebook*. 2nd Edition. Thousand Oaks, CA: SAGE.

Oliveira, T. and M. F. Martins (2011). "Literature review of information technology adoption models at firm level." *The Electronic Journal Information Systems Evaluation* 14 (1), 110–121.

Ordanini, A. (2006). *Information technology and small business: Antecedents and consequences of technology adoption*. Cheltenham and Northampton, MA: Edward Elgar.

Osterwalder, A. and Y. Pigneur (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. Hoboken, NJ: Wiley.

Paré, G. (2004). "Investigating information systems with positivist case research." *Communications of the Association for Information Systems* 13, article 18.

Pateli, A. G. and G. M. Giaglis (2005). "Technology innovation-induced business model change: A contingency approach." *Journal of Organizational Change Management* 18 (2), 167–183.

Rheingold, H. (1991). *Virtual reality: The revolutionary technology of computer-generated artificial worlds – and how it promises and threatens to transform business and society*. New York, NY: Summit Books/Simon and Schuster.

Rogers, E. M. (1995). *Diffusion of innovations*. 4th Edition. New York, NY: Free Press.

Saeed, K. A. and S. Abdinnour (2011). "Understanding post-adoption IS usage stages: An empirical assessment of self-service information systems." *Information Systems Journal* 23 (3), 219–244.

Steuer, J. (1992). "Defining virtual reality: Dimensions determining telepresence." *Journal of Communication* 42 (4), 73–93.

Suh, K.-S. and Y. E. Lee (2005). "The effects of virtual reality on consumer learning: An empirical investigation." *MIS Quarterly* 29 (4), 673–697.

Sutherland, I. E. (1965). "The ultimate display." In: *Proceedings of the International Federation of Information Processing Congress Vol. 2*, New York, NY, May 1965.

Trenz, M., J. C. Huntgeburth and D. J. Veit (2013). "The role of uncertainty in cloud computing continuance: Antecedents, mitigators, and consequences." *Proceedings of the 21st European Conference on Information Systems*, Utrecht, Netherlands, June 2013, paper 147.

Walsh, K. R. and S. D. Pawlowski (2002). "Virtual reality: A technology in need of IS research." *Communications of the Association for Information Systems* 8 (article 20), 297–313.

Wei, Z., D. Yang, B. Sun and M. Gu (2014). "The fit between technological innovation and business model design for firm growth: Evidence from China." *R&D Management* 44 (3), 288–305.

Wirtz, B. W., A. Pistoia, S. Ullrich and V. Göttel (2016). "Business models: Origin, development and future research perspectives." *Long Range Planning* 49 (1), 36–54.

Yin, R. K. (2014). *Case study research: Design and methods*. 5th Edition. Thousand Oaks, CA: SAGE.

Yoo, Y., R. J. Boland Jr., K. Lyytinen and A. Majchrzak (2012). "Organizing for innovation in the digitized world. *Organization Science* 23 (5), 1398–1408.

Zott, C. and R. Amit (2010). "Business model design: An activity system perspective." *Long Range Planning* 43 (2–3), 216–226.