

Theatre in the Digital Age: When Technology Meets the Arts

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Abstract. The evolution of new technologies and media in the knowledge era has had a huge impact on the field of the arts and culture. In particular, two areas should be highlighted: the way how the arts are created and the way how the arts are delivered to their audiences. In the first case, the new technologies and media enabled the creation of completely new forms of arts, mainly within digital culture. In the second case, the wide spread of internet, development of new personal devices and social media emergence caused radical changes in the distribution channels of cultural products based on their digitalization and dematerialization. However, these technological advances inspired not only the creation of new art forms but influenced also the presentation of traditional arts (theatre, opera ballet, etc.), especially by enabling multimedia experiences and interactivity. The aim of this paper is to discuss technological advances of the digital age and their impact on the performing arts, in particular the theatre. We address the evolution of a new theatrical complex art starting from the first multimedia experiments in the late 50s of the 20th century towards digital virtual interactive theatre platforms nowadays.

Key words: Technology, digital age, multimedia, virtual reality, interactivity, arts, theatre, knowledge era

1 Introduction

The evolution of new technologies and media in the knowledge era has had a huge impact on the field of the arts and culture. According to Cowen (2008, p. 261) the new technologies have significantly changed the field of cultural economics, more than in any comparably short period in human existence. In 1994 Pierre Lévy published a work entitled *Collective Intelligence: Mankind's Emerging World in Cyberspace*. The author pointed out the arrival of cyberspace in our everyday life, which will influence all kinds of human activities (including the arts) and challenge the ways we humans see ourselves in a philosophical sense. Lévy describes the intellectual development of humanity in terms of four great 'anthropological' spaces: earth, territory, commodity and knowledge. The fourth space – the knowledge space – relates to collective imagination, the production of knowledge, and the construction of intelligent communities with the help of computers (Lévy, 1994). According to Poore (2011, p. 20-21) it is the knowledge space, that concerns us in the digital age, which is opening up as a result of humanity's emergence into the cyberworld.

The term 'cyberworld', or alternatively 'cyberspace', is used to describe a virtual world of computers. The emergence of cyberspace is related to the development of knowledge society which is based on new information and communication technologies and people able to use these technologies. The cyberspace opens a wide spectrum of possibilities also for different kinds of artistic creations. In particular, the digital technologies and new media enabled the emergence of totally new forms of arts, and challenged the way how the arts are delivered to audiences. Kelemen et al. (2007) in the book entitled *Invitation to the Knowledge Society* highlighted the unprecedented intersections between culture & the arts, the science & research and information technologies in the knowledge economy resulting into a new form of culture – so called cyberculture. Moreover, the authors dedicate the whole chapter (2, p. 20 – 38) to the roots of knowledge society within culture and the arts. They provide numerous examples on how modern technologies have been influencing and inspiring new artistic expressions, and claim that the new devices and media catch the attention of artists from two perspectives: as tools for creation enabling to explore the living reality or as communication tools connecting an artist and the public (Kelemen et al., 2007).

The electronic, networked and interactive nature of the digital world has a significant impact on the arts. Special significance must be placed on the impact of networks and interactivity, as they open up new possibilities for dissemination and public engagement with artwork (Poole, Le-Phat, 2011, p. 4). The aim of this paper is to discuss technological advances of the digital age and their impact on the performing arts, in particular the theatre. We address the evolution of a new theatrical complex art starting from the first multimedia experiments in the late 50s of the 20th century towards digital virtual interactive theatre platforms nowadays.

2 Performing arts in the digital era

Digital technologies can be defined as “technologies that allow information and processes to be created and stored in digital form, with the possibility of distribution over electronic networks (Poole, Le-Phat, 2011, p. 9). Consequently, digital art is a general term for a range of artistic works and practices that use digital technology as an essential part of the creative and/or presentation process. Since the 1970s, various names have been used to describe the process including computer art and multimedia art, and digital art is itself placed under the larger umbrella term new media art (Paul, 2006; Wolf, 2009). Though digital media date back to the 1940s and digital arts to the 1950s, it is only since the mass marketing of personal digital technology in the mid-1980s and the arrival of the world wide web in the early 1990s that social science researchers have begun to ask themselves what is the relation between new media and development (Escobar, 2000; Castells, 2000).

The impact of digital technology has transformed activities such as painting, drawing, sculpture and music/sound art, while new forms, such as net art, digital installation art, and virtual reality, have become recognized artistic practices. Moreover, digital art offers new hope for art at a time when the traditional media seem to have exhausted their potential (Kuspit, 2014). However, artistic disciplines and practices have different dimensions in their relationship to digital technology (Figure 1). There are art forms that exist because of technology (digital arts practices and film, video) and art forms that are influenced by technology (new distribution means for music, e-books in publishing, live performing arts) (Poole, Le-Phat, 2011, p. 4).

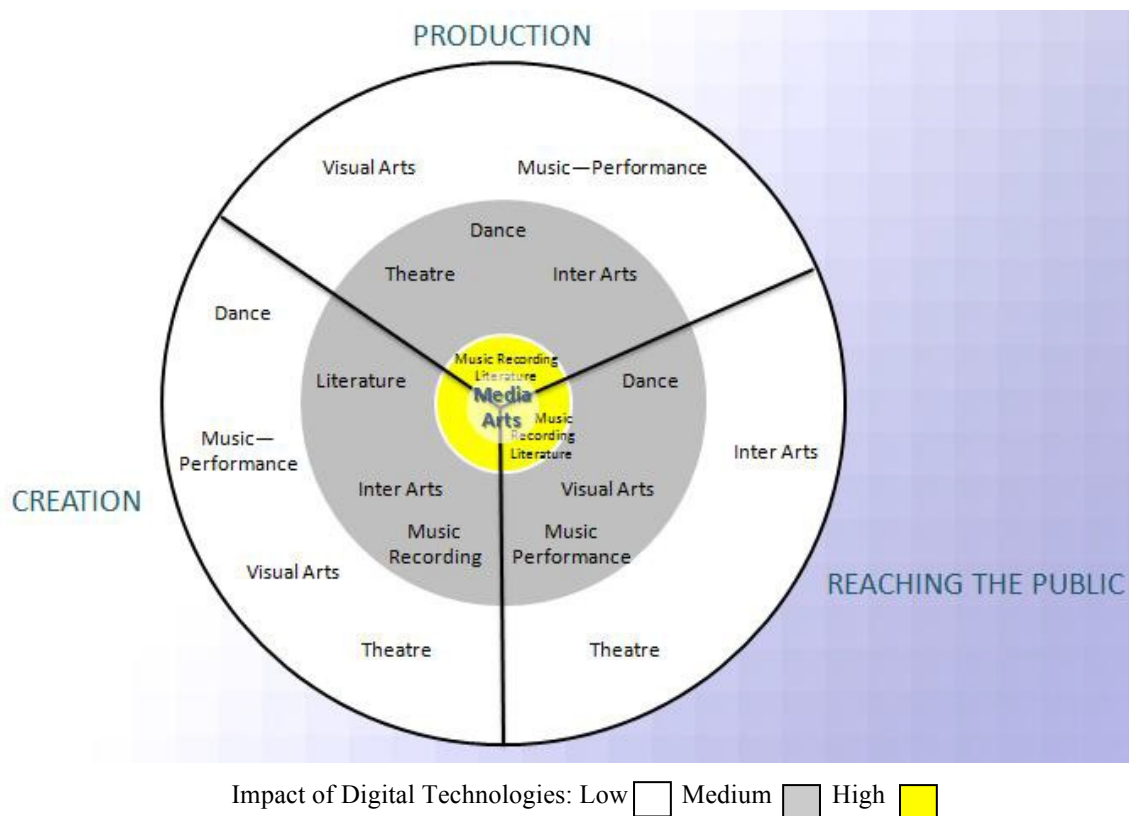


Figure 1: Impact of digital Technologies on different art sectors in view of creation, production and reaching the public. Poole, D., Le-Phat, H. (2011). *Digital Transitions and the Impact of New Technology on the Arts*. Report for Canadian Public Art Funders (CPAF) network, p. 18.

To date, new digital technologies have had their deepest impact on production and dissemination practices in disciplines and practices mainly outside the performing arts (theatre, opera, ballet, live music, etc.). Writing and publishing, music, media arts (film and video and new media) and visual arts all have practices involving the production of physical objects which are distributed to the public (books, recordings, films, tapes, photographs, etc.) The digital transition allows artists to replace physical objects with electronic files and to displace distribution over time and between places with instantaneous distribution over networks (Poole, Le-Phat, 2011, p. 4-5).

Nevertheless, the use of digital technology in theatre is increasing. The most evident impact can be seen within digitalization and audiovisual broadcasting. An innovative experiment was carried out by Metropolitan opera which started live streaming broadcastings of its opera performances into movie theatres around the world. Digital technology and internet has managed to get the opera show offstage and bring it closer to the spectators. This has increased the potential audience for MET live performances, and at the same time, strengthened the brand awareness worldwide.

In the second place, the digital technology has been influencing theatre staging elements allowing for experimental multimedia performances. The new staging features range from simple video projections to sophisticated virtual reality theatre simulations including interactive features.

On the other hand, according to Pew Research Center study on *Arts Organizations and Digital Technologies* (Thomson, Purcell and Rainie, 2013) the internet and digital technologies have also disrupted much of the traditional art world. It has changed audience expectations, put more pressure on arts groups to participate actively in social media and, in some circumstances, undercut organizations' missions and revenue streams.

The PEW study (Thomson, Purcell and Rainie, 2013 p. 51) identified several challenges presented by digital technology connected with changed audience expectations:

- The audience will have higher expectations for a live event in terms of a greater participation including behind-the-scenes access and higher quality of a performance.
- The audience has already moved from "arts attendance as an event" to "arts attendance as an experience." There is a desire for a full-range of positive experience from ticket purchase, to travel, to parking, to treatment at the space, to quality of performance, to exit.
- The audience will expect everything to be available digitally, and will require an engaging experience instead of a static one.
- The public expects internet and digital content to be free. However, there is a lack of awareness of the resources (funding and staff) that it takes to manage and preserve digital content. These costs will need to be passed on to users.

3 The origins of multimedia theatre

According to Cubitt (2009, p. 571) today's art is inseparable from media since all art is mediated. As a result, the artworld is coextensive with the world of the media. Throughout the history various kinds of media played the role of technological innovators within the arts. The way towards nowadays digital interactive virtual theatre was shaped by multimedia. According to Waltz (2000, p. 543) first multimedia experiments date back to the 1890s. Their evolution had gone through similar stages everywhere they were implemented. In the first stage a narrator was added to a silent film, in the second stage a projection on the backdrop in a theatre was combined with live actors, in the third stage the projection of the film and the events on the stage were alternated, and in the fourth stage interactions took place between live actors onstage and the figures on the film screen.

Well-known example on the fourth stage using a combination of live actors and film was *Laterna Magika* from the former Czechoslovakia presented for the first time at *Expo 58* in Brussels (Giesekam 2007, p. 53-58). The so-called 'Theatergraph' linked the static projection landing on a transparent projection screen behind the proscenium arch with the movements of performers in an interactive manner (Albertová, 2008, p. 57). The authors Josef Svoboda and Alfréd Radok had fully implemented the principle of interactivity between theatre and film, and had resolved number of specific technical problems with the aim to achieve a synthetic form of art (Stehlíková, 2011, p. 175). From the technical point of view the separate actions were set in counterpoint: either a live performer could move, or to the contrary movement occurred on the film screen. The important thing was a counter-movement of two corresponding actions requiring a perfect synchronization from production's stage managers (Figure 2). In all cases there was a significant interaction between a live actor on stage (dancer, musician, etc.) and action shown on screen (Stehlíková, 2011, p. 178).



Figure 2: Laterna Magika at Expo 58. A popular gag: a live dancer dancing with the filmed image of his partner. Archive of the Laterna Magika in Stehliková, E. (2011). The Laterna Magika of Josef Svoboda and Alfréd Radok. *Theatralia*, Brno: Masarykova univerzita, 2011, vol. 14, č. 1, p. 175.

The two components (theatre and film) were neither juxtaposed in mechanical rotation, nor did they merely serve to complement or illustrate each other, but they were equal partners generating diverse relationships and a new organic whole (Grossman, 1968, p. 74 in Havránek, 2002, p. 129). The enormous success of the Laterna Magika as a form of an ‘experimental theatre’ inspired a wide discussion about further possibilities of a new innovative genre. It was expected that it would lead to the comprehensive developments in stage structures, and eventually even to the emergence of new dramatists (Havel, 1999, p. 266; Stehliková, 2011, p. 179).

4 From multimedia towards virtual reality theatre

Virtuality is a reflex of contemporary developments in science, technology and art. It is mainly a feature of digital arts, related with a new world available due to technological evolution (Albuquerque and Almeida, 2012). According to Oliver Grau (2007) the enchantment for virtual, interactive and immersive spaces and environments has always been a constant in art history. Cavazza et al. (2003, p. 100) claims that Virtual Reality Art offers the perspective of creating alternative worlds that depart from our everyday experience of the physical worlds, however, not necessarily modelled after reality. Nowadays virtual art refers to artistic and aesthetical proposals that are developed in an immaterial and non-physical context, meaning that it refers to artworks that are not an “object” in the sense of its material presence but instead ephemeral objects that do not permanently exist, which are transient (Albuquerque and Almeida, 2012).

During the past decades, the virtual reality community has based its development on a synthesis of earlier work in interactive 3D graphics, user interfaces, and visual simulation. Currently, the VR field is transitioning into work influenced by video games (Zyda, 2005). Sherman and Craig (2003, p. 5) consider the virtual reality to be the most recent step in the progression of media used to convey and experience ideas. Similarly, according to Aylett and Louchart (2003, p. 2) VR should be considered as a specific narrative medium alongside other narrative forms such as theatre, literature or cinema. Moreover, VR given its interactivity and other particularities presents characteristics that none of the previously mentioned narrative forms possess, and should be recognized as such.

According to Sherman and Craig (2003, p. xviii) the research in virtual reality is turning the corner from being focused primarily on technology to an increasing focus on what can be done using VR – content is now

driving the application. Vaitovič (2012) argues that virtual reality, as known from the sci-fi literature from the 50s-70s of the 20th century, became feasible in the 80s-90s of the 20th century. However, it was dependent on the creation of a virtual environment, avatars and sophisticated hardware interfaces (glasses, gloves, helmet, cloths, etc.). Financial cost of these settings was so high that most of the endeavors of VR simulations were isolated within academic, research and military environment. Nowadays the most trivial interface (keyboard and mouse) together with modern devices (PC, tablet, smart phone, etc.) and internet connection became a natural tool for VR development. Nevertheless, this direction limits the VR phenomenon into a closed world of dematerialized computer projections. On the other hand, more advanced projection technologies are able to transfer a computer-generated image on a user's view of the real world, and create an immersive illusion, so called 'augmented reality'. The phenomenon of augmented reality is, in fact, the biggest benefit of the overlap between a real space and virtual space with diverse possibilities of its practical implementation (Vaitovič, 2012).

Nevertheless, VR has now progressed beyond the simple act of technological discovery towards a valid entertainment medium in its own right (Aylett and Louchart, 2003, p. 2). In case of theatre applications VR simulations enable an unexpected immersive emotional experience. Moreover, current projection technologies make VR simulation independent on hardware interfaces (e.g. helmet, glasses) and allow for VR illusion by direct perception, using perception tricks. The ultimate aim is to create an immersive illusion that could replace traditional sets with projectors, screens and computers, and thus move theatre staging elements to a technologically more advanced level.

However, according to Bierbaum (2001) one of the impediments to the wide spread use of immersive VR systems is the extensive technical expertise required of application developers. A software environment that provides abstractions from specific details of hardware configuration and low-level software tools is needed to provide a common base for the prototyping, development, testing and debugging of applications.

5 Participative features within a theatrical experience

The participation of the consumer in the production phase has been observed to increase with technological development (Shau, Muñiz, Arnould, 2009). Due to the wide spread of personal mobile devices and the emergence of consumer generated media, nowadays art consumers are empowered like never before. According to Chaney (2012, p. 42, 44) they have shifted from playing a passive role to becoming collaborators in the development of the offer. Schäfer (2011) highlights the birth of a new phenomenon – the 'participatory culture', in which users adopt new roles in the context of cultural production. As a result, cultural production moves to a new stage – the participative stage – in which users become co-creators of content.

This participatory culture can be increasingly observed also within the field of live performing arts. First of all, the performing arts are by their very nature experiential goods. According to German sociologist Gerhard Schulze (1995) a growing demand for experiential products is one of the most significant features of nowadays society. The behavior of the audience during the performance naturally affects the overall outcome of the performance. In addition, the performing arts share important characteristics with services (Grönroos, 1999) – simultaneity of the production and consumption, and interaction between artist and a different audience at each performance. Currently, an explicit interactivity within a live theatre performance can be achieved in two ways: via social media or via sensorial detectors connected with a computer.

Scott (2010) defines social media as an on-line space where people can share ideas, content, thoughts and relationships. He points out that social media differ from so-called 'mainstream media' in a way that anyone can create, comment and add to social media. Maurya (2011) advocates the term 'consumer generated media'. He describes it as a result of the transformation of technology and media, which gives users a personalized and efficient presentation of opinion over these platforms. Social media use web-based and mobile technologies to turn communication into interactive dialogue, allowing for the creation and exchange of user-generated content and providing a structure for people to get organized, exchange and collaborate (Poole, Le-Phat, 2011, p. 13). By allowing interactivity via personal mobile devices and social media the audience can interfere with a live performance and co-create the final shape of a theatre production at the place and in the moment of its presentation.

A different form of interactivity is enabled by the use of sensors and devices measuring momentaneous reactions of the audience (movement, temperature, proximity applause, smile, etc.), and thus enhancing the experiential elements of an event. In today's VR theatre applications the audience shall not have to wear 3D-glasses, instead the systems allow for perception tricks. The ultimate aim is to create an immersive illusion produced by VR software that may replace traditional sets with projectors, screens and computers, and thus move staging elements to a technologically more advanced level.

VR performance work tends to engage actively with open forms of audience participation and interaction: site-specific responses to space (whether virtual or actual) and the possibilities inherent in discontinuous, gaming, interactive and user/participant-led time frame. It invites the audience/viewers/users to participate in or interact with an art work that involves being able to navigate feely 'within' a three-dimensional environment created by computer software. However, this entails the use of sensors and devices to register input from the user/audience member to be integrated with the computer generated 3-D environment (Lahunta, 2002, p. 105)

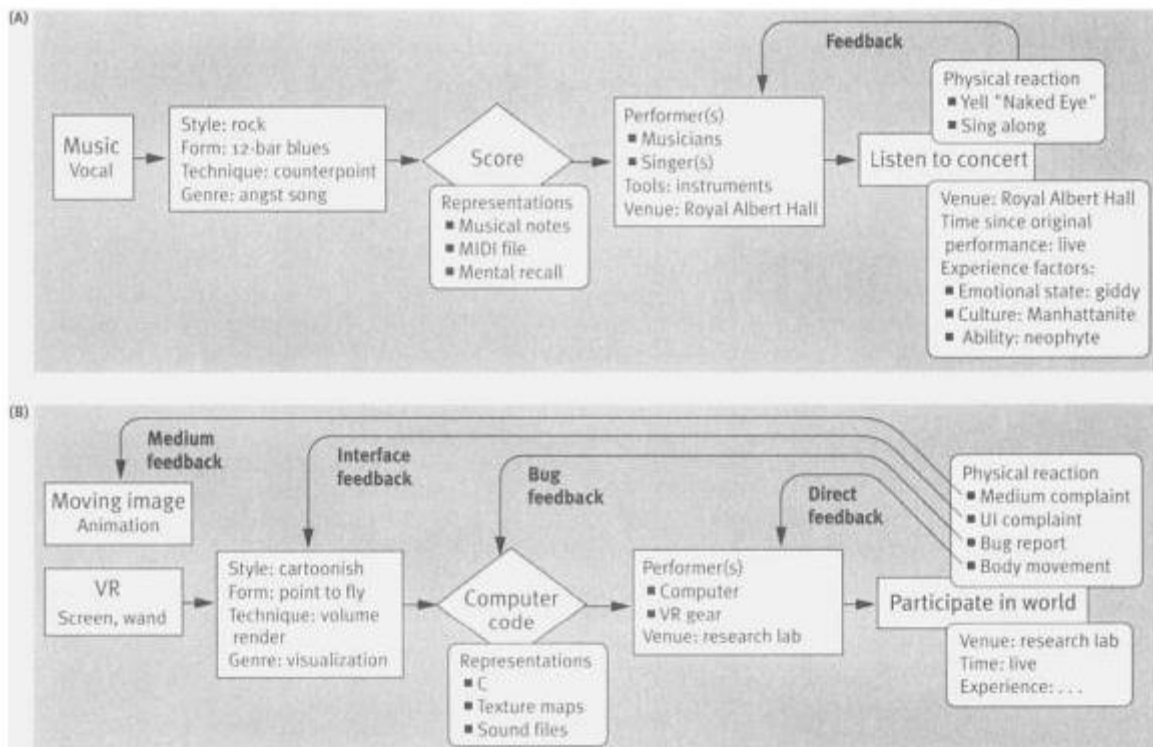


Figure 3: Sherman, W. R. and Craig, A. B. (2003). *Understanding Virtual Reality: Interface, Application, and Design*. Morgan Kaufmann, 2003, pp. 582.

The diagram (Figure 3) (A) demonstrates how a recipient's physical reaction to an experience can affect the presentation through feedback. In a live performance, audience feedback can often affect the performance itself; for instance, at a music concert, the enthusiasm of audience can affect how and what the musicians play. (B) Feedback is one of the key elements of virtual reality. For VR it is imperative that the virtual reality system be affected by the participant's physical reactions. Feedback can occur at many levels in VR experience. Interactive feedback occurs when a participant moves his/her head, resulting in updated sensory images being presented at the computer. Another level of feedback occurs when a participant reports a bug in the code the computer is performing, or they may report that a certain element of the application is difficult to understand, leading to a modification of the design of the virtual world (Sherman, Craig, 2003).

5 Conclusions

The ways in which art is created, produced, distributed, marketed, preserved and supported are shifting – in some instances transformed – in relation to the transition to a digital society (Poole, Le-Phat, 2011, p. 7). In case of nowadays theatre experimental practices, two new interactive stages should be added into the original Waltz's (2000) multimedia experiments classification: (5) interactions between live actors on the stage and computer generated images; (6) and interactions between the action on the stage and the audience. The first case has been enabled by virtual reality, resp. augmented reality simulations leading to the development of a new art form - virtual reality theatre. The second case encompasses intentional interactions via social media and non-intentional interactions via sophisticated sensorial devices.

The emergence of consumer generated media caused a real revolution on cultural markets. Artists have been increasingly engaged in cultural productions that take place especially within the cyberspace – the environment

of internet and social media. In addition, digital production and online distribution channels allowed artists to bypass traditional gatekeepers (recording companies, magazine publishers, bookstores, video rental stores, etc.) by placing work online directly (Poole, Le-Phat, 2011, p. 15). To conclude, due to the evolving technology and emergence of new media the process of arts creation and dissemination has been significantly transformed in the digital age.

However, there are certain limitations to the use of digital technologies within theatre. From the technological perspective interactive virtual reality system requires a huge amount of inputs both from the side of performers and audience. This complexity puts high requirements on a hardware-software solution and also on technicians operating the system. Another constraint is economic since the effective use of digital technologies requires investments into a trained staff and appropriate hardware-software equipment. With respect to social media although their usage is free of charge they are time consuming and their implementation usually requires a new person to be employed to take care about this type of communication channel.

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