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# Exploitation of the Virtual Worlds in Tourism and Tourism Education

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## Abstract

Academics perceive a great potential of virtual worlds in various areas, including tourism and education. Efforts adapting the virtual worlds in practice are, however, still marginal. There is no clear definition of the virtual world. Therefore the author of this article attempts to provide one. The paper also focuses on the barriers of a wider exploitation of the virtual worlds and discusses the principles that might help to increase their potential in tourism area. One of the principles – gamification – favours a wider adaptation of the virtual worlds in tourism. Applying gamification principles provides visitors with some unique experiences while serving as a powerful marketing tool for institutions. The benefits of implementing tourism education activities based on cooperative principles set in an immersive environment of the virtual worlds are depicted afterwards. Finally, this paper includes successful case studies, which show advantages and drawbacks of some approaches in exploiting the virtual worlds in tourism and tourism education.

## Keywords

Virtual worlds, tourism, education, gamification, Second Life

**JEL classification:** L83, D83, O33

## Introduction

Tourism is one of the catalysts of global economy. It is also one of the fastest developing market environments. Technology, having nowadays a serious impact on almost all aspects of human life, contributes to the development of tourism, opening a range of new possibilities. For example, Neuhofer, Buhalis, and Ladkin (2014) believe that technology is significantly changing the tourism experience. ICT (Information and Communication Technology) affects education as well. Lapin (2009) claims that students are acquainted with the technology more than ever before. Communication technologies ranging from mobile phones to social networks prove to be completely natural for them. According to Penfold (2009), they want and expect more engaging, empowering, and interactive learning experiences in their student life than universities are normally able to offer them.

The paper summarizes scientific knowledge about the virtual worlds in tourism and education up to now and presents original thoughts that provide a perspective on the research issue. The main contribution of the paper is that it bridges the gap among the individual research areas, which are tourism, education and virtual worlds as a subfield of computer science. Experts in tourism and education will get acquainted with the virtual worlds in the context of their professional interests. It may help them to recognize both benefits and limitations of the virtual worlds for their work. The paper provides a systematic overview of available research with focus on recent works, supplemented with case studies and practical examples, including one in which the author himself participated. Moreover, related concepts or topics are briefly explained. These include gamification, or immersive experience captivating students' emotions, which may provide readers with guidance on relevant research. In addition, the paper clearly defines the relevant terms and provides a comparison of two most important virtual environments used in higher education.

## Approaches to the researched issue

The aim of this paper is to characterize the area of using the virtual worlds in tourism and tourism-oriented education, to understand area's state of the art and to determine its future development.

Firstly, the paper synthesizes various perceptions of the virtual worlds and chooses a proper description suitable for the context of tourism and tourism-oriented education. Secondly, the paper covers the current state of the use of the virtual worlds in tourism and education in tourism. The barriers preventing their wider adaptation are examined as well. Thirdly, it describes approaches which could improve virtual worlds' usability and might attract more attention from workers and other people involved in tourism. The following section focuses on an educational potential of the virtual worlds in the field of tourism studies together with the benefits it might bring. Finally, case studies illustrating the successful implementation of the virtual worlds in the area are presented and discussed in order to describe benefits, barriers and potential of the virtual worlds in tourism.

The paper is based on an extensive literature review. The author decided to focus primarily on electronic sources available in online scientific libraries. The main reasons were topicality and availability of papers describing the topic. The literature review enabled the author to choose the topic which has remained mostly unexplored, avoiding thus redundant research. Considering the fact that the field of the virtual worlds is developing rapidly, the author focused primarily on sources from the last decade. However, in order to grasp a wider perspective and provide solid grounds for the research, some older sources were used as well.



## Definition of the key terms

The virtual worlds are not a discovery of the last few years although they have changed a lot since their appearance. Although they appeared already in 70s, there has not been a clear definition of the virtual worlds so far. This is related to the broad term of 'virtual', as well as to the fact that the whole area is developing rapidly. Definitions do not keep pace with the development and are outdated a few years after their first appearance. The perception of the virtual worlds meaning also differs when it comes to institutions, scientists and media, which makes any effort for a generally accepted definition even more difficult.

Hodges, Ulinski, Bloodworth, Hayes, and Smotherman (2011) perceive the virtual world as any electronic environment which presents or replicates complex physical places and where people can communicate with objects and other people using their avatars. The virtual world is thus perceived as a reflection of the real one. Lifton and Paradiso (2009) chose a different approach, describing the virtual worlds as a synonym of immersive 3D environment enhanced with natural interactions between citizens and tools, allowing customizing the environment freely. They claim that the purpose of the environment should not be to copy the existing world; it should rather extract features on which human interaction is founded. Elements such as physical laws, movement and principles of topography all contribute to the sense of presence in the virtual world.

Bell (2008) attempted to combine several definitions, which were all describing various aspects of virtual worlds, but none of them completely. Some were focused on the definition of the world while not paying effort to explain the term virtual. Others were investigating features of virtual worlds such as synchronicity, but were neglecting technology necessary for their implementation. And other studies were discussing the technical side while not paying attention to the role of users. By synthesizing different definitions, Bell (2008) came up with a combined definition: Synchronous, persistent network of people represented as avatars, facilitated by networked computers. Lapin (2009) notices similar principles while emphasizing the possibility to participate in activities together, in real time. The virtual worlds allow creating, editing and importing user created content. They should also encourage users to form social groups. Other academics (Huang, Backman, Chang, Backman, & McGuire, 2013) also emphasize synchronous communication channels.

Based on the definitions mentioned above, the paper acknowledges the virtual worlds as **synchronous** (interactions between objects and users take place in real time), **persistent** (the worlds' existence is not dependant on user's logging in, it cannot be paused) **3D environment** which is composed of the **network of people** (every user becomes part of the ecosystem and his/her behaviour influences the environment around him/her). The user may enter the world via a computer connected to **the Internet** and s/he is represented by **avatar,** which means actions of an autonomous user are presented as actions of his/her avatar. It is necessary to mention that there are virtual worlds running on a local network as well. This paper, however, will not focus on this category because the option to be connected with others, regardless the distance, is one of the most significant benefits of the online virtual worlds.

Successful adaptation of the virtual worlds also requires a choice of the right platform. In this paper the word platform will be perceived as a specific technical solution of virtual world technology. The examples of the virtual world platforms are Second Life and OpenSimulator (OpenSim).

## Exploitation of the virtual worlds in tourism

The impact of ICT on tourism and hospitality is, according to Cantoni, Kalbaska, and Inversini (2009), one of the major changes of the last years. ICT influenced the ways of communication with **potential** tourists as well as the processes of buying goods and services. Neuhofer, Buhalis, and Ladkin (2012) claim that the integration of ICT has especially benefited the facilitation of experiences. With new technologies being developed, new types of tourist activities are emerging. They can both transform conventional experiences and result in the emergence of new types of tourism experiences.

The virtual travelling should not be perceived as a competitor for the physical one. Warburton (2009) mentions one reason to claim so, emphasizing the possibility to visit places otherwise not accessible, which may be historically lost, too distant, too costly, imaginary, futuristic or even impossible to see by the human eye. When it comes to accessible places, both worlds can supplement each other and become undivided ecosystem. The virtual world may serve as a place to promote a destination and mediate easily accessible information in an interactive way and at the same time illustrate the offered services. The virtual environment may also stimulate the image of the destination as perceived by a potential tourist. Some relevant effort has been already implemented in practice as it is shown in the Case studies section of this paper.

Rather than an ongoing trend, these are some of rare examples of using the virtual worlds in tourism. One of the causes might be the fact that the platforms delivering the virtual worlds' experience were originally developed neither as education tool nor for usage in tourism industry. The result is that those working in such fields are not aware of virtual worlds' potential benefits. Another barrier precluding a wider dissemination of the virtual worlds in tourism and hospitality field is a lack of complex research focused on questions like which form of the virtual marketing would be the most useful

for destination promotion or which factors would influence the decision-making process of potential tourists.

Duncan, Miller, and Jiang (2012) noticed that virtual worlds were often perceived as an environment for computer games. Chen and Su (2011) report that the combination of interactive 3D graphics, simulation technology, virtual reality and VoIP protocol was first implemented in gaming industry. This means that the virtual worlds based on the environments with the same features are closely related to the gaming principles. The recent trend called **gamification** favours the exploitation of the virtual worlds in tourism area. Applying this trend could contribute to the wider adaptation of the virtual worlds.

According to Deterding, Dixon, Khaled, and Nacke (2011), gamification stands for applying game principles and mechanisms outside their original domain. Hunicke, LeBlanc, and Zubek (2004) claim that the principles of gamification may be systematically explained by using the MDA (Mechanics-Dynamics-Aesthetics) model which divides the game systems into three components influencing game-like experience – mechanics, dynamics and aesthetics. The game mechanics include achievements, collections, or badges. The purpose of dynamics is to connect a player with the system via his/her freedom of choice, various types of challenges, team cooperation or conversely competition. Aesthetics comprises an emotional response of the player. By setting the optimal ratios of each of the components into the framework, a unique gaming experience is possible.

Academics (Xu, Buhalis, & Weber, 2017) notice increased attention towards gamification in business, marketing, education or healthcare specialists. It is well known that the correct use of the gamification principles may lead to richer interactions, a higher level of satisfaction as well as it can raise the brand awareness and improve user's attitude towards the brand. Therefore gamification seems especially useful in tourism area. As an innovative marketing tool, it may attract a potential visitor and help promote less known tourist destinations. Activities such as 'treasure hunting' set in the target area motivates travellers to explore various locations or collect souvenirs without any need to have winners and losers, as highlighted by Deterding et al. (2011).

In relation to the increasing role of technology in gaining experiences, Neuhofer et al. (2012) mention the term 'technology enhanced tourism experiences'. With the rapid development of modern technologies, visitors are looking for more personal, richer and more memorable experiences which may be delivered only by the environment offering a high level of participation and affecting cognitive perception. Some academics (Bogdanovych et al., 2007) suggest using the 3D virtual environments which offer a stimulating, funny and immersive experience applied in travel marketing. Gamification in virtual reality thus represents a powerful marketing tool for travelling industry because it allows users to get to know the location they show interest in, granting them memorable experiences and subconsciously, raising the brand awareness and desire to visit the location in person. Research (Xu et al., 2017) indicates that virtual worlds stimulate emotions connected with imagination. The freedom of choice in customizing the avatar appearance and freedom of movement stimulates user's imagination which leads to a higher level of satisfaction. And it is in user's interest to have the opportunity to repeat these experiences.

The success of implementing the gamification principles depends on the rate of visitors' involvement. The users involved in the virtual environment creation and development are creating bonds with the environment. Academics (So, King, Sparks, & Wang, 2016) believe that visitors becoming part of the environment with an option to influence it; they become more active, involve more emotions and above all, they create loyalty towards the brand, for example, for a specific tourist destination.

The basic feature of all games is their entertaining potential and thus, the gamification activity based on the gaming principles has to be fun to fill its purpose. Based on time they are taking place in relation to the trip, we can divide the activities into three groups. We can talk about the pre-trip games, games during the trip and after the trip. The activities before the trip should provide basic information to potential tourists and raise their interest. Their interest may be implemented in form of buying goods and services and through gained loyalty to the brand. The purpose of the activities taking place during the trip is to enhance and enrich recreational experiences and involvement of the travellers. The activities designed for the period after the trip should help recall pleasure moments and should encourage users to share their experiences with other. This can lead to another promotion of the destination. The nature of the 3D virtual worlds seems to make them ideal for the pre and after-trip game-like activities.

Xu et al. (2017) also mention some weaknesses of the gamification concept. Gamification, for example, attracts mostly younger generation. It is also very closely bound to the content and well-thought concept. The implementation needs to make activities fit into the context of offered services. At the same time it needs to keep them funny, intuitive and aligned with the destination philosophy whether it is oriented to relaxation, adrenalin, or ecology.

Djorgovski et al. (2009) forecast that the virtual worlds will become a standardized interface for browsing the web, thus changing the very foundations of the way people usually gain information and communicate with each other. The authors perceive the virtual worlds as another step towards connecting people with the world of information and knowledge. Such change would have a massive effect on almost all aspects of life, education and tourism. According to Miniwatts Marketing Group (2016), the circumstances favour such pace of events due to an increasing number of people having access to the Internet while at the same time hardware powerful enough to experience virtual worlds is becoming available at relatively low prices.

Authors, however, admit that the adaptation of the virtual worlds on a large scale has not happened yet. Even though researches (Allison et al., 2012) notice that many subjects have successfully integrated the virtual worlds in their processes, on the worldwide scale these are just sporadic attempts, fragmented in a variety of platforms and approaches. Neuhofer et al. (2014) claim that the problem does not consist in the insufficient technology development; it is rather a matter of integrating the technology in general. Even though the potential of the virtual worlds is well acknowledged among academics, Djorgovski et al. (2009) admit that there are still not enough examples of good practice. The area of the virtual worlds exploitation has not been explored enough, Therefore further research is needed.

## Adaptation of the virtual worlds in tourism education

ICT has strongly influenced tourism industry, less attention, however, is paid to technologies available for tourism education. This should change because academics (Singh & Lee, 2009) claim that effective teaching of travelling and hospitality has to include modern technologies. ICT has a potential to deliver a beneficial education process with focus on cooperation and interaction between the faculty and its students.

According to Singh and Lee (2009), tourism and hospitality industry is considered to be one of the industries with the highest rates of fluctuation and lower qualification. Cantoni et al. (2009) added that training in this area is also very expensive and time consuming. Sigala (2002) claims that the Internet and especially e-learning offer much needed flexibility which is crucial for conditions specific for tourism and hospitality. Cho and Schmelzer (2000) are suggest that modern technologies have the potential to help students acquire critical thinking so that they can learn how to solve problems operatively, making quick decisions while using modern technologies effectively.

The target group, based on the use of technology, are primarily young people such as part-time students of tourism related fields that need to have interactive education materials available together with the option to consult study materials with their tutor in a flexible way. Another significant group involves employees in hospitality industry looking for the opportunities of lifelong learning in order to be able to connect their professional knowledge with up-to-date theoretical progress. Both groups have in common the need for elements of interactive communication and cooperation. Even though the exploitation of ICT for educational purposes has many advantages, one of the criticised factors is a lack of social contact and the sense of community (LaPointe, 2008). This is related to another problem which is the absence of synchronous communication. That means there is no way to discuss matters in real time in the learning environment. This works as a barrier preventing creating social connections with the tutor and other students. The education process thus loses its cooperation character which would otherwise greatly stimulate student's effort.

One of the solutions for these drawbacks might be the adaptation of the 3D virtual worlds into tourism education. The virtual worlds allow creating copies of real spaces and integrating them into the virtual worlds which make them within a reach of many more people. The adaptation of the virtual worlds in tourism education may deliver more than just vicarious experiences which students gain from watching travelogues, pictures, maps and similar materials. By using the virtual worlds, user becomes present 'on the ground' and may autonomously decide where he or she wants to go or to what s/he wants to pay attention.

Konstantinidis, Tsiatsos, Demetriadis, and Pomportsis (2010) suggest that the 3D virtual worlds should prove to be an efficient way of education. Huang et al. (2013) focused on factors influencing the overall impression of students involved in tourism-oriented education which took place in the 3D virtual world. The results of the study suggest that the virtual environments should have the potential to become a learning and training tool for both teachers and professionals from the tourism industry. The study applied

the self-determination theory (SDT) which assumes that intrinsic motivation is supported by satisfaction of three basic psychological needs – the need for autonomy, competence and relatedness. The research confirmed the relation between the satisfaction of psychological needs for autonomy and motivation. Similarly, the sense of connection with other citizens of the virtual world seems to stimulate student's intrinsic motivation. However, no correlation between the satisfaction of the need for competence and the rate of student's motivation was registered. Furthermore, the study confirmed the relation between the intrinsic motivation and the level of positive emotions. The results suggest that positive emotions should play the crucial part in the learning process and should be at the same time connected with the level of satisfaction of needs for autonomy and relatedness.

According to Dalgarno and Lee (2010), teachers and all institutions around the world feel the potential of the 3D simulations, games and other virtual environments for the purposes of education. Above all, they highlight the high rate of student involvement and possibilities of exploring the environment and creating and controlling the objects. In addition, Ketelhut, Nelson, Clarke and Dede (2010) observe the improvement in work efficiency. Rogers (2011) emphasizes the role of immersion and role-play which motivates students to become researchers or explorers. The virtual worlds provide a platform for various education activities such as experimenting, exploring and creative constructing. The role of these features is emphasized by Neuhofer et al. (2014). They claim that technology and co-creation are both the key parameters for the development of enhanced experiences. Penfold (2009) believes that such environments are suitable for tourism education, considering possibilities such as setting virtual trips, guided tours or role-play activities. They also fit the purposes of design learning. Other authors (Zelenskaya & Singh, 2011) perceive the potential in the area of human resources (HR). Organizing the virtual trade fairs might prove very helpful for both human resources officers and job seekers, particularly in the tourism industry. Employees hired in the virtual worlds might be trained in the same environment afterwards.

A study by Berns, Palomo-Duarte, Dodero, and Valero-Franco (2013) claims that there were increasing efforts to discover the potential of computer games and other virtual environments for education. However, many of them contended with a lack of empirical studies focused on such issue. Pellas (2014) adds that there is also limited research describing the level of services, measuring affectivity and complex functionality. In spite of the virtual worlds being available for years, the need for additional research is evident. According to Blas, Bucciero, Mainetti, and Paolini (2012), the technologies have the potential to dramatically influence the process of education if exploited correctly and in the context of well thought conception. This shows how education which needs to integrate the experience-based learning is closely related to tourism as a way to gain such an experience. Moreover, benefits of both areas can be stimulated by modern technology.

## Case studies

Due to the rapid development of the virtual worlds' field, the supply of the virtual worlds' platforms changes accordingly. One of the most popular platforms is Second Life founded in 2003 by Linden Lab. In 2007 Roush (2007) mentions Second Life as one of many 3D virtual worlds platforms such as There, Moove, Habbo Hotel or Kaneva. In 2009 Warburton (2009) perceives Second Life as the most mature community platform for the virtual worlds. One research study (Blas et al., 2012) which was held in 2010 evaluated Second Life as by far the most popular platform used by education institutions from New Media Consortium. And in 2014 Ambrose (2014) describes Second Life together with OpenSim as two most important virtual environments used in higher education.

There are some examples of the exploitation of the virtual worlds in tourism using Second Life as a platform. Even though Second Life has many limitations including paid regions, intellectual property politics and other weaknesses related to the proprietary systems, it exceeds alternative platforms such as OpenSim in population and diversity of space. These strengths are closely related because majority of the content in Second Life is created by users as stated by Duncan et al. (2012).

In Second Life it is possible to visit many cities and other locations such as the historical district of Salvador – Pelourinho, several versions of Eiffel Tower, virtual Berlin, Vienna, and Krakow. Popularity of Second Life attracted commercial subjects from the technology fields such as IBM or Microsoft, clothes manufacturers, car producers, network operators and news agencies such as Reuters and CNN. Hay (2008) informs that St. Louis Convention & Visitors Commission bought the land in Second Life to build significant memorials, streets and buildings there. Huang et al. (2013) mention the Mexico tourism board building a replica of Chitzen Itza to motivate tourists to visit the original place. Another example is the Starwood Hotels Company that had made a prototype of a new hotel and was testing it and collecting feedback about possible improvements from potential customers. Even embassies of Sweden and Estonia have their virtual presence in Second Life as mentioned by Zelenka, Pechanec, Bureš, Čech, and Ponce (2008). They continue with an example of good practice of virtual city Bohemia which has been built by using typical Czech architecture. Among other subjects, a virtual office of CzechTourism is set in Bohemia. It serves as an official in-world tourism representation of the Czech Republic. Directly in the virtual world, visitors have access to information about the Czech Republic in form of pictures, interactive maps and videos. Visitors may even book a flight ticket or a hotel room.

Despite several attempts to adapt the virtual worlds in tourism focused education are rare, there are some successful examples available. Deale (2013) describes a project which involved 117 students facing various subjects focused on recreology and tourism in 5 semester timespan. The lessons were focused on topics regarding travel and tourism, careers in hospitality and tourism, introductory management practices, human resources issues, food service, lodging, meetings, conventions, and special events, cruises, and private clubs. The virtual world platform Second Life was used as a primary tool for synchronous learning. The tutor worked as a consultant rather than the traditional

teacher. Reviewing of eating places was part of the students' activities, whether located in real world or in the virtual one. Another activity was designing a retail outlet for food and beverage items in cooperation with an industry partner. The results indicate that most of the students (94 out of 117) were satisfied with the involvement of the virtual worlds in the learning process. They mostly appreciated the possibility to share ideas with each other and present information in an innovative way. The level of participation differed greatly. The tutor found a group of students engaged in the course related discussion several times, planning their presentations even after the class was dismissed and they were not required to be there. Others completed their tasks, but they did not show much additional interest in finding out other ways to use the environment for personal use. Students from one of the five classes showed little interest, did much less work in classes and seemed to have more technical problems.

Another education project established in Second Life aimed at tourism students is described by Penfold (2009). The existing infrastructure and the number of active users were among the reason why project team chose Second Life. The virtual orientation program aimed to cultivate new learning experiences for the students in preparation for their first year of university life. Students in general perceived using the virtual world of Second Life in education positively. Penfold (2009) emphasizes that responses changed depending on the nature of the activity. For example, the guest room design activity was well accepted by students in contrary to the field trip activity which was considered interesting by a much smaller number of students. He also mentions studies that demonstrated how role-playing in teaching tourism and hospitality developed interest in the topic and retention of knowledge and skills, captured students' imagination, stimulated involvement and helped build the confidence of students in a non-threatening environment. When it comes to challenges encountered during the project, Penfold (2009) mostly mentions technical difficulties regarding lack of infrastructure to support large-scale implementation and need for new users to familiarize with the interface which proved to be time consuming. This is partly connected with the lack of technical skill on the users' side. Penfold (2009) perceives intellectual property and security issues as another downside as well as the existence of an inappropriate content in the world of Second Life. And finally, cost may be a deterrent for some universities as stated by Kluge and Riley (2008).

The case studies showed some problems with using Second Life as a platform for education purposes. Moreover, Milano, Vanfretti, and Morataya (2008) claim that the proprietary software restricts students' freedom. Even though Second Life is widely used and has a large-scale world, it comes with compromises related to its proprietary software model. Many of the encountered problems could be avoided by using an open-source-based platform such as OpenSim. That is why Allison et al. (2012) perceive OpenSim as a natural successor of Second Life.

Projects (Zejda & Canoy, 2015) carried out in 2013 were using the virtual worlds as an environment for specialized English language courses for professionals from different fields, tourism included. Dedicated regions were established in OpenSimulator to support the courses but according to the character and objective of each session, other

in-world locations were used as well. The bridge between the OpenSimulator instance and the information system was established. This allowed monitoring the avatar presence, managing the course and collecting feedback. Such approach was possible because OpenSim allows the full control over the server part of the virtual world architecture. This allows the exploitation of various modules implementing scripting algorithms without limitation as well as it gives freedom to independent developers to customize interface or add additional functions not present in the OpenSim core code. OpenSim is free and all editing becomes author's property. Exporting and importing creations are not paid either. The openness of the virtual worlds is in consistence with the principles of modern education which emphasizes free knowledge and curiosity stimulation. The positive aspects of using OpenSim were already recognized by Konstantinidis et al. (2010), Che et al. (2011), Lapin (2009), or Henckel and Lopes (2009).



## Results

This paper provides a thorough synthesis of published studies relevant for the research topic, which allowed drawing conclusions about the state of the art as and indicating directions of possible progression of the exploitation of the virtual worlds in tourism and education in tourism. It presents different perceptions of the virtual worlds and a proper description of the virtual worlds suitable for their exploitation in tourism and education as a synchronous and persistent 3D environment composed of the network of people represented by avatars.

In addition, the paper examined the potential of the virtual worlds in tourism while focusing on the current state of their use and barriers preventing their wider adaptation. After that, it described approaches which could improve the virtual world usability and might attract more attention from workers in tourism area. Specific attention was paid to the process of gamification and application in the virtual worlds for tourism.

The potential of the virtual worlds for education in tourism together with potential benefits was examined. The virtual worlds might fulfil the need of a flexible and modern education tool which can support interactive communication, cooperation and creativity.

Finally, some case studies of successful implementation of the virtual worlds in the area were presented. They prove some of the benefits of the virtual worlds in the discussed context and also reveal certain weaknesses of the used platforms or application scenarios.

## Conclusion

With new technologies being developed, new types of tourist activities are emerging. These can both transform conventional experiences and result in the emergence of new types of tourism experiences. Travelling using the virtual worlds should not be perceived as a competitor for physical travelling. Both worlds – real and virtual one – can supplement each other and become undivided ecosystem. The virtual world may serve

as a place to promote a destination, easily mediate accessible information about the destination and also stimulate the image of the destination as perceived by a potential tourist.

Considering the fact that the virtual worlds are based on a game-like environment, recent trend called gamification – applying game principles and mechanisms outside their original domain – favours the wider adaptation of the virtual worlds in tourism and education. Visitors nowadays are looking for more personal, richer and more memorable experiences. Freedom of choice in customizing avatar appearance and freedom of movement stimulates users' imagination which leads to higher level of satisfaction. Allowing them to be involved in creating and developing the virtual world lets them create a bond to the environment. Applying such gamification principles in tourism area may grant experiences they are looking for and at the same time raise the brand awareness and improve their attitude towards the destination. The potential weakness of gamification is that it attracts mostly younger generation and it is also very closely bound to the content which must be suitable for the adaptation of the gamification principles.

While e-learning in general offers much needed flexibility in tourism education, it often lacks a social contact, a sense of community and the possibility to communicate synchronously. The virtual worlds have the potential to overcome these drawbacks by applying cooperative principles in the immersive environment. Teachers and institutions around the world feel the potential of the 3D simulations, games and other virtual environments for the purposes of education. Academics claim that the virtual environments have the potential to become a learning and training tool for both teachers and professionals from the tourism industry. Positive emotions and sense of autonomy and relatedness is connected with students' intrinsic motivation. The research suggests that virtual world should stimulate such feelings, potentially improving students' results. Generation of people expecting the information accessible readily and conveniently requires the integration of new education technologies which can satisfy such demand.

The results of the case studies support the claim that the virtual worlds have a great potential in tourism and tourism education field. Technology itself, however, does not guarantee the success. The implementation of technology must be in consistency with a well thought concept. In spite of the overall positive reactions from students, there is a need of further research on the exploitation of the virtual worlds in tourism and hospitality oriented education. It is especially important to find out which factors have a high impact on the character of students' response to the implementation of the virtual worlds in learning. Attention must be also given to the selection of the virtual world platform. Although Second Life is popular, has a great number of users and might be the best choice for some projects, it shows some serious drawbacks. The open-source-based virtual worlds such as OpenSim might offer a similar immersive experience without financial, technical or other barriers. Their potential in tourism and tourism education should be further investigated.

Some predictions expect the virtual worlds to become a standardized interface for browsing the web. However, the adaptation of the virtual worlds on a large scale has not happened yet. The technology has not become a standard tool for tourism or educa-

tion either. This might be caused by a lack of awareness of their potential and a lack of complex research in the areas of interest which would describe the level of services and measure effectivity and complex functionality.

In general, this paper bridges the gaps between tourism, education and certain subfields of computer science. Such an interdisciplinary approach is important for the solution of complex problems in the ever-changing world. Tourism-oriented experts might reveal the potential of the virtual worlds for their work together with the related limitations, experts in computer science could learn how their work is perceived by users from the fields of tourism and education. The knowledge may serve them as feedback for designing better interactive environments. The thorough synthesis of the state of the art provided in the paper may help researchers to get acquainted with the topic and, perhaps, find new *paths* for their research.



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