

AUGMENTED REALITY AS A POWERFUL MARKETING TOOL

Gabriela Gabajová¹, Martin Krajčovič², Beáta Furmannová³,
Marián Matys⁴, Vladimíra Biňasová⁵, Marián Stárek⁶

Abstract: Today's market is oversaturated with new technologies that are slowly moving through our daily routine. Businesses often have to pursue new strategies to reach new customers and retain existing ones. Popular technologies of today undoubtedly include virtual reality (VR) and augmented reality (AR). The application of augmented reality in the field of trade, marketing, promotion of products and services has its own potential and justification. A questionnaire survey of the current state of AR utilization in companies of Central Slovakia shows that the interest in the use of this technology exists in this area, although in practice it is implemented rather rarely. However, a suitable design solution and the worldwide trend of smartphone use can help to achieve the goal of greater implementation. The design of the methodology for the use of AR in the field of marketing consist of a sequence of several basic steps. Verification of the proposed methodology is carried out on a practical example by creating a real mobile application using augmented reality to promote the selected product. The final mobile application includes several attractive features for the end-user which can be accessed through a smartphone and displayed in augmented reality. Such a mobile application in augmented reality provides the company with a powerful marketing tool, but it also has its limitations.

JEL Classification Numbers: D47, L10, M30, **DOI:** <https://doi.org/10.12955/peb.v2.253>

Keywords: augmentation, marketing, mobile, experience, application

Introduction

The emergence of new marketing trends is influenced by constant development, the emergence of innovations, and changes in the market environment. World markets are facing changes and companies must adapt to this phenomenon (Vavřík, 2020). With growing competition in the market, it is necessary to attract potential customers not only with the product itself, but also with modern marketing. Nowadays, consumers are even more demanding, they want easy access to products and services (Bučková, 2019). When dissatisfied they move to the competition, so it is important to have a competitive advantage and provide quality service (Richardson, 2019). One of the attractive tools to achieve this goal is the application of augmented reality technology into the field of marketing. The potential use of augmented reality technology in business and marketing has long been talked about in the world. Nevertheless, the long-term effects of the use of augmented reality in this area are still relatively unknown due to the lack of measurable values and elements (Bulearca, 2010). However, its proper use can help increase the competitiveness of products and services (Vilkina, 2020). The goal is to present the possibilities of using augmented reality as a marketing tool for the promotion of products and services. Partial goals are to compile an overview of the current state of use of augmented reality in selected companies in Slovakia, to present the methodology of creating an application for marketing in the augmented reality environment and finally to verify this methodology on a specific example.

Theoretical basis

Marketing mix and mobile marketing

The well-known model of the marketing mix includes four basic components, those are product (an end product that meets the needs of the end-user), price (the price that the final consumer is willing to pay), promotion (promotion of products to the end-user), and placement (ensuring the transport of the product from the manufacturer to the consumer) (Barnard, 2020; Boučková, 2003). By using new trends in marketing communication there is a transition from classic marketing and "push strategies" to modern

¹ University of Žilina, Faculty of Mechanical Engineering, Department of Industrial Engineering, email: gabriela.gabajova@fstroj.uniza.sk

² University of Žilina, Faculty of Mechanical Engineering, Department of Industrial Engineering, email: martin.krajcovic@fstroj.uniza.sk

³ University of Žilina, Faculty of Mechanical Engineering, Department of Industrial Engineering, email: beata.furmannova@fstroj.uniza.sk

⁴ University of Žilina, Faculty of Mechanical Engineering, Department of Industrial Engineering, email: marian.matys@fstroj.uniza.sk

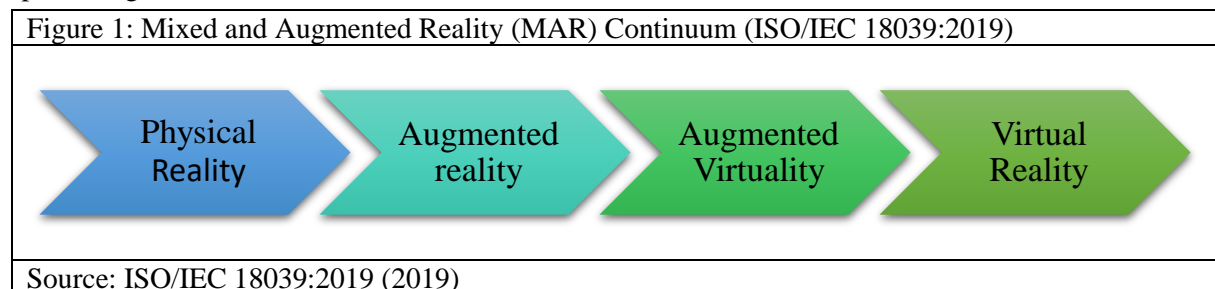
⁵ University of Žilina, Faculty of Mechanical Engineering, Department of Industrial Engineering, email: vladimira.binasova@fstroj.uniza.sk

⁶ University of Žilina, Faculty of Mechanical Engineering, Department of Industrial Engineering, email: staremri@schaeffler.com

methods and "pull strategies". Instead of a product, production and sales-oriented style that uses a single communication channel, modern marketing of today focuses on the customer, listens to his needs, and offers him several communication channels (Pilík, 2008). Nowadays, marketing must not be understood in the old sense of sales, but in the contemporary and holistic sense of satisfying customer needs (Bickhoff, 2016). The current trend, which is the mass use of mobile devices encourages the use of augmented reality in the field of trade and promotion. Mobile marketing is one of the direct methods of marketing making use of mobile devices such as smartphones, tablets and, to some extent, laptops. Because these mobile devices enable the display of digital content in a real environment while constantly evolving, it creates an environment suitable for the development and creation of applications in augmented reality (Liao, 2015). Thanks to the popular trend of using smartphones, which are now multifunctional devices, mobile marketing is one of the fastest-growing and most used marketing methods (Matúš, 2011).

Mixed and augmented reality (MAR)

Augmented reality (AR) is a variant of virtual reality, as can be seen in Figure 1. Virtual reality does not allow an immersed user to see the real world around him. The goal of augmented reality is to create a feeling that both real and virtual elements exist in one world and combine together (Gómez, 2020). Augmented reality is defined by ISO / IEC 18039: 2019 (2019) as a "type of mixed reality system in which virtual world data are embedded with representation of physical world data". Mixed and Augmented reality (MAR) is a combination of real and virtual components according to the relative composition of physical and virtual elements that are coordinated in space. Augmented reality itself is characterized by three characteristics which are placing virtual content in real space, real-time interactions, and experience in three-dimensional space (Berry, 2021). The most common ways to place virtual objects into real space and display them in augmented reality are image target, model target, spatial target and mark/marker.



Data and methodology

The initial phase of the survey aimed to determine the current level of augmented reality utilization within micro to medium-sized enterprises in central Slovakia. 26 companies were contacted through the form of an online Google questionnaire. The field of operation of the addressed companies was diverse, namely industrial production, manufacturing, provision of services and consulting companies. According to the form of business, various forms were also addressed, namely joint-stock companies, limited liability companies, sole proprietors and one association. As part of the online questionnaire, we asked participating respondents what form of marketing they currently use in their marketing activities, whether they know the technology of augmented reality and whether they would be interested in using it to promote products or services. The results of the questionnaire were evaluated in the form of graphs with a percentage expression of answers. The next step of the research was the design of a methodology for creating an augmented reality application for business and marketing. The methodology was verified on a real example by creating a mobile application using Vuforia Studio from PTC.

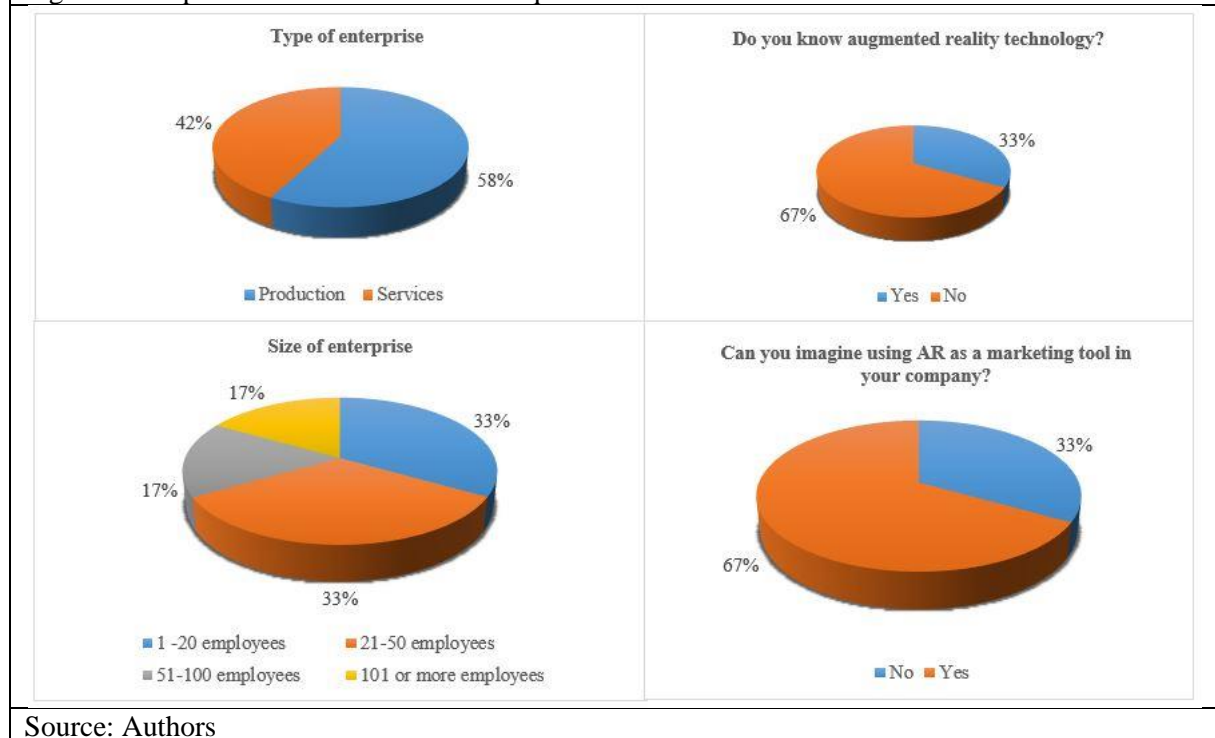
Results

Marketing mix and mobile marketing

As mentioned above, the questionnaire survey addressed 26 companies, which were divided into four categories according to size (in terms of the number of employees) to evaluate the results. The results of the online questionnaire show that the use of augmented reality is currently less widespread, although companies are aware of this technology. The use of augmented reality is rather the domain of larger companies. Small businesses, especially self-employed, rarely encounter this technology. Nevertheless,

67% of respondents said they would be interested in using this technology to promote their products and services as shown in Figure 2. The decisive factors were the simplicity of the application, its availability to regular users, the cost of the application and its benefits.

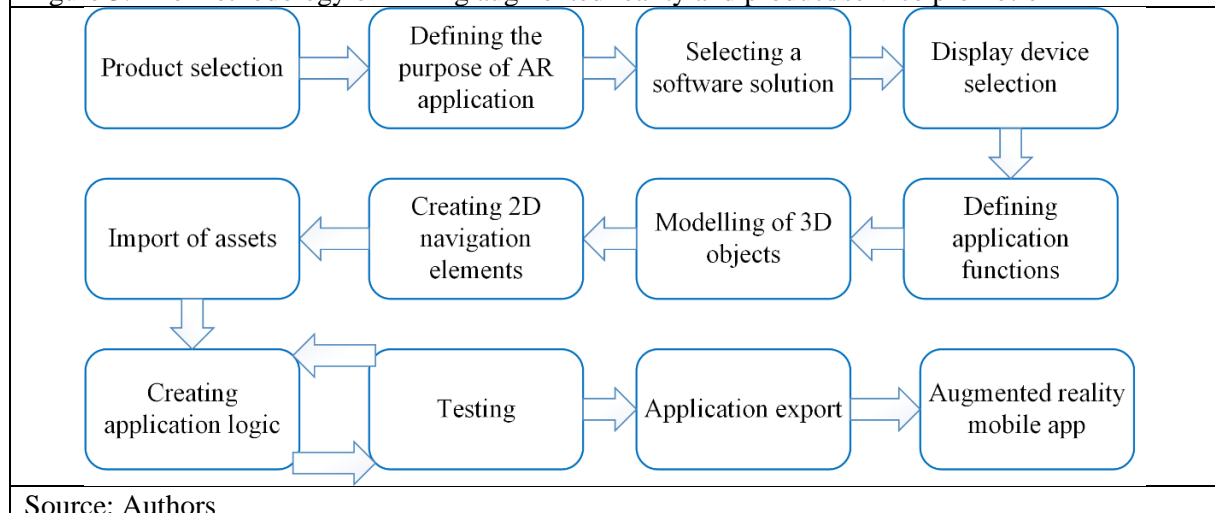
Figure 2: Graphic evaluation of the online questionnaire



The results of the questionnaire showed that the most frequently used forms of marketing within the addressed companies include:

- retail marketing – the area that has the greatest influence on the customer's shopping behaviour and leads him to the last step of the purchase. A typical example is the distribution of goods on shelves and their relocation (Frey, 2011).
- word of mouth marketing - marketing based on informal communication, personal experiences and recommendations.
- product seeding - the essence of this method is to provide samples of products with the assumption they will spread positive reactions (Přikrylová, 2010).
- influencer marketing - nowadays, this method comes to the forefront thanks to the power of social networks. The principle is based on the idea that celebrities can influence the views of potential consumers.

Figure 3: The methodology of linking augmented reality and product/service promotion



Proposal for the use of augmented reality technology in trade and marketing

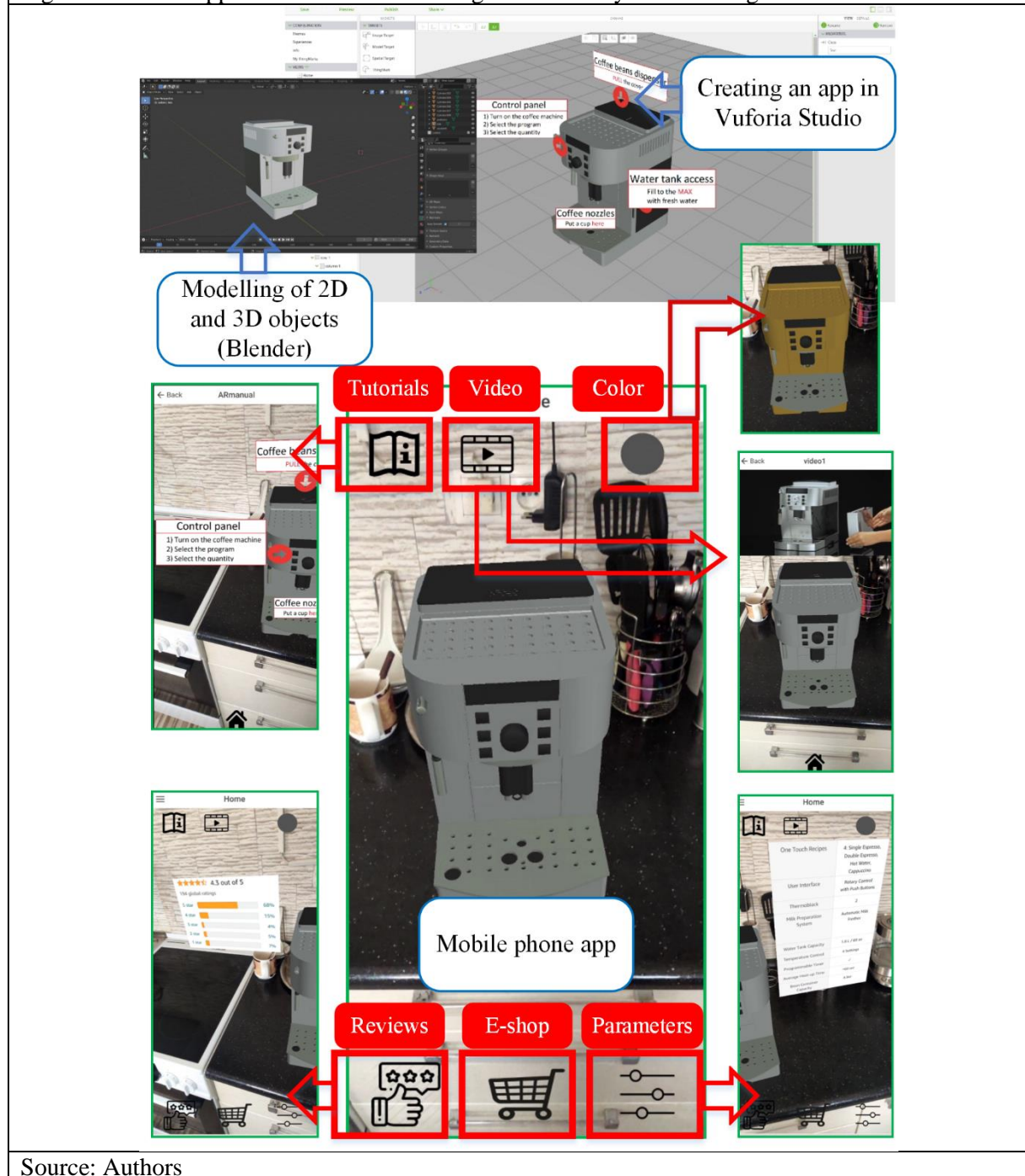
The current development and digital industrialization enable the gradual exchange of activities through technologies (Fusko, 2017; Kliment, 2020). Within the concept of Industry 4.0, it is necessary to understand that it is possible to transform some human activities utilizing available technologies (Horváthová, 2019; Štefánek, 2003). As mentioned above, the marketing mix consists of four basic components. Augmented reality technology can be applied to product promotion as part of a marketing mix that is attractive to the end-user. Another component of the marketing mix that can take advantage of this technology is the product, in the sense of the provision of an additional service (for example, in the form of an installation and service guide based on AR via a mobile phone or tablet). The methodology of linking augmented reality and product (service) promotion can be summarized in the following steps which are shown in Figure 3.

The methodology was verified on a real-life example. A coffee machine was selected as a product for promotion through augmented reality, with an additional service of providing a product manual via AR. The purpose of the created application is to provide the user with a mobile application via a smartphone or tablet, that can help the customer to choose a coffee machine from the available options and its suitability by placing it in the real space of their home. If they are interested, they can also buy it using this application. The additional service of the application is the availability of a product manual and maintenance instruction for the chosen type of coffee machine displayed in the augmented reality. The process of creating an augmented reality application according to the proposed methodology is as follows:

1. Product selection – a coffee machine was chosen as the target product for augmented reality promotion.
2. Defining the purpose of the AR application - the purpose of the application was defined in two objectives. The first goal is to provide the end-user with a library of available coffee machines that are modelled in 3D. A selected model can be placed in their kitchen on a 1:1 scale in real-time using AR. The second goal is to provide an additional manual, instructions, or simple maintenance for the exact type of selected product.
3. Selecting a software solution - Vuforia Studio created by PTC was chosen as the software solution for creating the augmented reality application. Vuforia Studio offers the display of objects in space using image target, model target, spatial target and specific ThingMark. For our application, a spatial target method of displaying objects was chosen. Its principle lies in the tracking of the surrounding space and the possibility of placing virtual models anywhere in this area.
4. Display device selection - Vuforia Studio allows user to create augmented reality applications for 2D Eyewear, 3D Eyewear (such as HoloLens), and mobile devices such as tablets and smartphones. Given that the application must be available to the widest possible audience of users, we decided to choose the platform for smartphones and tablets.
5. Defining application functions - This step determines all the functions that the final application should support. In this particular case, the user first selects a product from the library, which can vary according to the type of product. The user can choose different types of coffee machines, change their colours, etc. After placing the object in the space, the user can also view additional types of information, such as the basic parameters of the product and available reviews. Furthermore, the user can access the seller's page and order the product. Other functions of the application are the provision of a manual in augmented reality via 2D navigation panels or a video.
6. Modelling of 3D objects - objects that we want to display in augmented reality must be first created/modelled. For the purpose of creating this example, Blender, an open-source software distributed under the GNU GPL license for modelling and rendering 3D computer graphics, was used to model the coffee machine. Other modelling software solutions can also be used, such as Maya from Autodesk or Creo from PTC.
7. Creating 2D navigation elements - 2D navigation elements or navigation panels are used to display textual information about the product (parameters, product evaluation, price information, etc.) and allow for navigation between various functions. In the final application

this information is displayed using buttons which the user can use to control the displayed information.

Figure 4: Mobile application for the use of augmented reality in marketing



Source: Authors

- Import of assets – after creating all the necessary 2D and 3D objects, the creation of the AR application can begin. First, it is necessary to import all created objects (assets) into the project. These are placed in the planned location by setting their coordinates, rotation, and other parameters. It is also a good idea to check if all objects are displayed correctly and, if necessary, correct any visual discrepancies.
- Creating application logic - application logic provides all basic and advanced functions. This involves user interaction with the display of the selected device and the subsequent response of the application to this input. Therefore, it is necessary to connect all the elements that interact with each other and set the type of mutual interaction. Simple interactions can be created with pre-built software features. For more complex ones, it is necessary to use a programming

language (according to the selected software). The complexity of this part is directly proportional to the complexity of the application itself and the functionality of the whole project is depended on it.

10. Testing – the creation of the logic should be followed by application testing and verifying the functionality of all buttons, added animations and elements. If errors occur during testing, we revisit the logic creation step.
11. Application export - in the case of application creation in Vuforia Studio, the application is exported by publishing the project to the cloud, which has the function of a storage and model database.
12. Augmented reality mobile app - to view the augmented reality app on your mobile phone or tablet you need to have the Vuforia View app installed, which is available on Google Play.

The result, after the implementation of all methodology steps, is an AR application for a smartphone or tablet. The structure of the application and its functions can be seen in Figure 4. The user is offered 6 basic functions for the selected coffee machine model, namely displaying product reviews, redirection to the seller's website, displaying basic coffee machine parameters, selecting colour variants, displaying a product manual in AR, and the viewing of an instructional video. With the help of the application, the customer can try out the product in AR before purchasing it.

Conclusion

There is great potential in the use of augmented reality for marketing and business purposes. The results of the survey showed that larger companies are more aware of this technology. Smaller companies and sole proprietors encounter augmented reality rarely. The suitability of using AR as a marketing tool is promising in the field of product promotion. The main advantage of this form is the possibility of products visualization and the accessibility of operation instructions, while everything is realized remotely using a smartphone or tablet. Thanks to this, companies can provide their customers with "something extra" from the comfort of their own home. The paradigm for this marketing model can be various companies, such as IKEA, which has long used augmented reality as a support tool for visualizing objects in the customer's home. The benefits of using AR in marketing is accessibility with smartphones as part of our daily lives, AR applications are as accessible as conventional leaflets or e-shops. The second benefit is that it allows for the company to stand out from the crowd by using modern technologies for product promotion. This may just be what makes the customer choose your company. The third benefit is convenience. By trying how well products fit into customers' homes before buying, may increase the buying rate. This feature alone may attract a lot of potential customers. The possible shortcomings of using AR in marketing include relatively complex development because of an AR application requires resources and knowledge from various fields. Therefore, the company should be well prepared before augmented reality implementation. The next shortcoming is cost and time. More complex AR application development can be quite time-consuming. On top of that, high-end augmented reality hardware is relatively expensive. However, in the case of marketing, a smartphone or tablet should be enough for the majority of applications.

This work was supported by the Slovak Research and Development Agency under the contract No. APVV-19-0305 Integrated Modular System of a Factory Twin.

References

- ISO/IEC 18039:2019. (2019). Information technology — Computer graphics, image processing and environmental data representation — Mixed and augmented reality (MAR) reference model.
- Barnard, F. L., Foltz, J., Yeager, E. A. (2020). Agribusiness Management. Routledge. doi:DOI: 10.4324/9780429324420-10
- Berry, A. (2021). Augmented Reality Introduction : What is Augmented reality. Retrieved from PTC, university learning connector: <https://learningconnector.ptc.com/content/tut-5959/augmented-reality-introduction-what-is-augmented-reality>
- Bickhoff, N., Hollensen, S., Opresnik, M. O. (2016). The Quintessence of Marketing What You Really Need to Know to Manage Your Marketing Activities. Springer-Verlag GmbH.
- Boučková, J. (2003). Marketing [Marketing]. Praha: C.H. Beck.
- Bučková, M., Skokan, R., Fusko, M., Hodoň, R. (2019). Designing of logistics systems with using of computer simulation and emulation. Transportation Research Procedia, 978-985.
- Bulearca, M., Tamarjan, D. (2010). Augmented Reality: A Sustainable Marketing Tool? Global Business and Management Research: An International Journal, 2(2), pp. 237-252.

- Frey, P. (2011). *Marketing communication: new trends 3.0* [Marketingová komunikace: nové trendy 3.0]. Praha: Management Press.
- Fusko, M., Rakyta, M., Manling, F. (2017). Reducing of Intralogistics Costs of Spare Parts and Material of Implementation Digitization in Maintenance. *Procedia Engineering*, 213-218.
- Gómez-Tone, H. C., Martín-Gutierrez, J., Valencia Anci, L., Mora Luis, C. E. (2020). International Comparative Pilot Study of Spatial Skill Development in Engineering Students through Autonomous Augmented Reality-Based Training. *Symmetry*, 12(9). doi:10.3390/sym12091401
- Horváthová, B., Dulina, L., Čechová, I., Gašo, M., Bigošová, E. (2019). Data collection for ergonomic evaluation at logistics workplaces using sensor system. *Transportation Research Procedia*, 1067-1072.
- Kliment, M., Trebuna, P., Pekarcikova, M., Straka, M., Trojan, J., Duda, R. (2020). Production Efficiency Evaluation and Products' Quality Improvement Using Simulation. *International Journal of Simulation Modelling*, 470-481. doi:10.2507/IJSIMM19-3-528
- Liao, T. (2015). Augmented or admented reality? The influence of marketing on augmented reality technologies. *Information, Communication & Society*, 310-326. doi:10.1080/1369118X.2014.989252
- Matúš, J., Petranová, D. (2011). New trends in marketing communication [Nové trendy v marketingovej komunikácii]. *New marketing trends* [Nové trendy v marketingu] (p. 247). Fakulta masmediálnej komunikácie, Univerzita sv. Cyrila a Metoda v Trnave.
- Pílik, M. (2008). New marketing trends as an opportunity to increase the influence of marketing on achieving competitive advantages [Nové marketingové trendy jako příležitost zvýšení vlivu marketingu na dosažení konkurenčních výhod]. *E+M Ekonomie a Management*, XI(2), 107-119. Retrieved from http://www.ekonomie-management.cz/download/1331826674_8502/10_pilik.pdf
- Přikrylová, J., Jahodová, H. (2010). *Modern marketing communication* [Moderní marketingová komunikace]. Praha: Grada.
- Richardson, N. (2019). *The Marketing Mix*. New York : Routledge, 2019.: Routledge. doi:DOI: 10.4324/9780429399114-3
- Stefanik, A., Grznar, P., Micieta, B. (2003). Tools for continual process improvement - Simulation and benchmarking. *Annals of DAAAM for 2003 & Proceedings of the 14th International DAAAM Symposium: Intelligent manufacturing & automation: Focus on reconstruction and development*, (pp. 443-444). Sarajevo, Bosnia & Herceg.
- Vavřík, V., Gregor, M., Grznár, P., Mozol, Š., Schickerle, M., Ďurica, L., et al. Design of Manufacturing Lines Using the Reconfigurability Principle. *Mathematics*. doi:10.3390/math8081227
- Vilkina, M. V., Klimovets, O. V. (2020). Augmented Reality as Marketing Strategy in the Global Competition. In E. G. Popkova, & O. V. Sergi, *The 21st Century from the Positions of Modern Science: Intellectual, Digital and Innovative Aspects* (pp. 54-60). Cham: Springer International Publishing. doi:DOI: 10.1007/978-3-030-32015-7_7