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DEVELOPMENT DIRECTIONS OF THE GAMING INDUSTRY AS OPPORTUNITIES FOR PEOPLE WITH DISABILITIES

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Purpose: The study's main objective was to identify potential directions for developing gaming and virtual reality that can contribute to bridging the exclusion of people with disabilities. The specific objectives were to isolate functioning facilities for people with disabilities in the gaming market and to identify prospects for further development of technology-affecting facilities for gamers with disabilities.
Design/methodology/approach: The author discussed existing gaming solutions as facilities for people with disabilities and then presented directions for further industry development about players with various disabilities and disorders. Subsequently, the author pointed out several benefits of gaming for people with disabilities. The paper also includes the author's identified limitations of the analysis made. In the desk research method, the author used the following scientific databases: PubMed, ResearchGate, Taylor and Francis Online. The author based his considerations primarily on foreign literature on the subject.
Findings: Video games can benefit people with various disabilities and disorders - improving their physical fitness, sensorimotor coordination, spatial orientation, motivation and self-confidence. Players with disabilities can experience improvements in mental health, well-being, and behavioural change. Games focused on disability as a starting point stand out enormously. Identifying barriers among players with disabilities presents an opportunity to improve game design and development practices.
Social implications: Inclusivity and diversity in games mean opening up to an increasingly wide range of players - without dividing them by gender, ethnicity, cultural background or type of disability. A socially desirable approach in this regard should result in the ability to personalize characters in games with different skin colours, body sizes, and stories related to culturally diverse characters. In doing so, game designers should focus on friendly and healthy communication during gameplay.
Originality/value: The author directed the article to all interested in the gaming industry, including gamers with various disabilities and disorders, to make them aware that more and more improvements are for excluded groups. The numerous benefits for gamers with disabilities speak for the right direction of the industry. In the author's opinion, it is necessary to systematically check reports from the gaming world in the context of innovative facilities that contribute to bridging the exclusion of people with disabilities.

Keywords: gaming, people with disabilities, virtual reality, accessibility, inclusivity in gaming.

Category of the paper: General review.

1. Introduction

Information and communication technologies are now integral tools of the educational process. These technologies help students with various needs and disabilities, including those with special educational needs, change their attitude from passive to active, forming independence and autonomy in various activities. The importance of games, including digital games, as tools for the learning process, has grown tremendously in recent years, highlighting their numerous benefits (Chaidi, Drigas, 2022). ICTs are tools that enable people with disabilities to escape isolation and stigma. In addition, access to the Internet improves how people with disabilities assess their level and quality of communication with others, their sense of independence and self-determination (Dobransky, Hargittai, 2006).

Researchers also highlight the Internet's significant impact on sex education for excluded groups. They point to this medium as a potentially valuable source of comprehensive, interactive and youth-friendly sex education in reaching marginalized groups, including but not limited to people with disabilities (Franco Vega et al., 2022). However, according to the authors, it is unclear which elements of digital games facilitate positive outcomes to improve the sexual health of adolescents with disabilities. Further research is needed in this area, as relatively few studies were to date, with inconclusive results. There is, therefore, a good direction for the development of virtual reality as an opportunity for people with disabilities (Pereira et al., 2021).

People with intellectual and developmental disabilities (IDD) have less access to and participation in digital citizenship activities, putting them at greater risk of digital social isolation and lack of community involvement (Fisher et al., 2021).

A tremendous opportunity for a better understanding the needs and peculiarities of gamers with disabilities seems to be the fuller and more widespread presence of characters with disabilities in games. It could also contribute to eliminating mental limitations in a large community of gamers who often perceive disability in a stereotypical way and as a source of fear (Stasieńko et al., 2021).

The article's main objective is to identify potential directions for developing the gaming industry in the context of people with disabilities. The specific objectives are: to discuss the existing gaming solutions as facilities for people with disabilities and to present the directions of further development of the industry in this regard. The author studied the literature on the subject mainly from 2020-2022.

2. Methodology

The author used the desk research method. He analyzed the literature treating the development of gaming and virtual reality in bridging the exclusion of people with disabilities from the digital world. The bibliography includes 23 items, including scientific articles, reports and electronic sources - mainly from 2020-2022. In the desk research analysis, the author used the following scientific databases: PubMed, ResearchGate, Taylor and Francis Online. The author used mentioned scientific databases because of the collecting literature for this article about the purpose of the work.

3. Existing gaming solutions as facilities for people with disabilities and directions for further development of the industry

The field of adaptive video games has been proliferating in recent years. Many adaptive video game controllers are now accessible to people with disabilities who can access a standard controller. Facilities range from head-controlled pneumatic joysticks to customizable gaming platforms, allowing users to connect external joysticks and accessibility switches (Redepenning et al., 2022). Other conveniences for players with disabilities include the option to hold the button instead of button mashing, the option to auto-target opponents, and the option to change graphics, i.e. to distinguish the colour of opponents from each other and the environment (Malinowski, 2019). Assistive mode, on the other hand, is an option for players with visual, hearing and mobility impairments that allows them to customize gameplay more suitably. For example, one can turn on invincibility or disable automatic aiming (Harris, 2021).

Other gaming facilities for players with various disabilities include (Cieślak, 2022): the ability to change the size of the font according to one's preferences; the ability to distinguish critical elements of the game not only through colours but also through symbols; the ability to change the size of subtitles, as well as to increase the contrast of visual elements; the ability to change the mapping of keys according to one's preferences; the ability to change the required reaction time, the dead zone of analogues or slowing down the control; the ability to change the difficulty level of different elements of the game, independently of each other; the display of a maximum of two lines of subtitles containing 37 to 42 characters at any given time so as not to lead to cognitive overload; visual signals in the form of sound waves propagating from the direction of noise investigation. Other dedicated gaming solutions for people with dyslexia and epilepsy include the ability to scroll the subtitles further by pressing the appropriate button, use a particular font to make reading more accessible, and disable sequences with fast flashes (Cieślak, 2022).

Within the development of the gaming industry in the context of people with disabilities, several directions should be pointed out. Eye Gaze Gaming technology has excellent potential as a functional computer interface for children with severe dyskinetic cerebral palsy (DCP) (Bekteshi et al., 2020). The authors, based on the results of a pilot study to examine the ability of participants to acquire specific skills related to visual control in games, i.e. operational competence (screen navigation and dwell function), point to the possibility of improving communication skills and levels of participation and quality of life among players with DCP.

Promising potential for learning and competence acquisition by children and adolescents with cognitive or physical disabilities shows Serious Games (Keller et al., 2021). The results show that these games can effectively support subject-specific learning, acquiring learning-related skills, and improving behaviours necessary for this process. At the same time, Christopher Keller et al. (2021) indicate that the effectiveness of Serious Games, as well as approaches to their meaningful methodological and didactic integration into school lessons, have not yet been sufficiently studied, and further in-depth research in this area is needed.

Xiaoyi Hu et al. (2020) indicate the effectiveness and efficiency of computer-assisted visual association instruction for children with autism spectrum disorder (ASD) and other developmental disabilities. In their study, the authors compared the effectiveness and efficiency of using computer-assisted instruction (CAI) and teacher-implemented instruction (TII) to teach visual association skills to students with ASD or other developmental disorders. CAI included discrete trial instruction with a gesture-tracking application, while TII included traditional one-on-one instruction using cards. The results showed that both CAI and TII were effective. However, CAI was more effective than TII regarding the prompts and instructional session duration. CAI also resulted in greater student engagement in self-directed learning (Hu et al., 2020).

The potential for engagement, access and conceptual development of students with disabilities is Dream 2B, a universal online game about fractions. By helping students understand fractions, the game introduces them to the world of science, technology, engineering and mathematics, as well as information and communication technology (ICT). Complex mathematical content, such as fractions, is challenging for all students, especially those with mental retardation. The Dream 2B game provides students with multiple ways to access the material and demonstrate conceptual understanding of complex school material in an enjoyable way (Hunt et al., 2022).

The directions for further development of the gaming industry include combining video games with physical exercise, increasing players' motivation and shaping their physiological well-being. This solution can improve health and physical fitness and rehabilitate people with various disabilities and disorders. Active video games are a way to reduce sedentary behaviour and increase physical activity among people with physical disabilities and limitations in lower limb function (Rowland et al., 2016). Using an adapted controller provides a convenient way for people with mobility impairments to engage in active video games of light to moderate

intensity, reducing sedentary leisure lifestyles (Malone et al., 2021). According to a game design study focused on improving the lives of gamers, including those with disabilities and limitations, players show greater comfort when they realize that a motion-based form is in an environment familiar to them. However, at the same time, they are intrigued by the possibility of rediscovering the game through a new way of interaction (Kabir et al., 2020). Sofia Balula Dias et al. (2022) suggest more targeted activities and different game difficulty levels - consistent with the age and abilities of students with disabilities. Such adaptive game-based learning design with attention to the characteristics of students' disabilities is likely to increase their attention spans. Also important is the aspect of technology integration (Dias et al., 2022).

Another direction in developing the gaming industry is introducing an enhanced design and evaluation framework of eudaimonia (personal growth, expression) and hedonic (pleasure, comfort) into cooperative games for older adults using an electric wheelchair. The purpose of such a treatment is to satisfy two psychosocial well-being needs - perceived task mastery and empathy enhancement - through a game with an interactive format that enhances the experience of using an electric wheelchair. A mixed reality with interaction and mobility-based movement is occurring here. Compared to the game without it, the mixed reality version elicited eudaimonic experiences in adult participants, which included their perception of a positive change in the mastery of wheelchair-use skills (Seaborn et al., 2020).

Promising study results (Szczepańska-Gieracha et al., 2020) confirm the effectiveness of various forms of virtual reality (VR) therapy in alleviating psychological and behavioural problems and mental disorders among post-stroke patients. However, there is a lack of VR-based technological solutions that, in addition to physical rehabilitation, offer such patients therapeutic tools to alleviate psychological disorders and improve the patient's moods and motivation. According to the study's authors, such solutions have the potential for intensive research in the coming years.

Finally, games focused on disability or diseases that can lead to it stand out enormously. Disability is the starting point in these games, both in the narrative and mechanics. This situation shows that consistently appealing to the deep level of experiences, feelings and forms of perception of reality by people with disabilities makes it possible to create unique games. These types of games show high social impact. Sometimes, however, the game mechanics, narrative, or interface solutions are clunky, cumbersome and discouraging, so not all attempts are always successful. In doing so, the author would like to mention that independent developers create most such games, which come with various inconveniences and barriers - if only financially (Stasieńko et al., 2021).

4. Benefits of gaming for people with disabilities

For people with disabilities, technology plays a unique role in facilitating social interaction and interaction among people with disabilities. Technicization and advances in computer and communications technology allow these people equal access to many activities. The benefits of gaming for people with disabilities are enormous. Among them are (Chaidi, Drigas, 2022): gaining experience in everyday situations, developing problem-solving skills, preparing for social integration, increasing concentration, increasing satisfaction, perseverance, personal commitment to tasks, reducing anxiety, increasing initiative and the value of participation, feeling included in society, developing socialization. Irene Chaidi and Athanasios Drigas (2022) stress that integrating digital technologies into education is very productive in the context of special education by transforming learning into play. Using digital games is a valuable tool to support the development and social competence of people with various disabilities, including hearing or vision problems, mental retardation, learning disabilities, and pervasive developmental disorders. Virtual reality provides enjoyable entertainment and opportunity to develop motor, cognitive and social skills for people with disabilities (Dias et al., 2022).

Computer games can improve language, math and social skills and general knowledge for children with special educational needs. Such games can improve facial recognition skills, especially for children with autism. Through gaming, children with this type of disability can learn new skills and become less timid and confident. Computer games can also help children with developmental disabilities participate in job training and prepare for employment. For children with ADHD, on the other hand, gamified learning increases motivation and concentration and addresses their behavioural problems. Individualized and well-chosen games also improve visual perception and reasoning skills in children with learning disabilities (Stankova et al., 2021).

People with disabilities can temporarily disconnect from their "diagnosis-based" identities, physical and social limitations and stigmas by playing games. Playing provides them with a refuge for their identities, creates community and provides enjoyment. In addition, gamers with disabilities have significantly more positive perceptions of the impact of games on employment than their non-disabled counterparts (Weston et al., 2020).

In conclusion, video games can benefit people with disabilities by improving their physical fitness and sensorimotor coordination. They also prevent diseases such as asthma and diabetes. Players with disabilities improve body movements, spatial orientation, motivation and self-confidence. Mental health, well-being and behavioural change in people with disabilities are strengthened or improved through play (Weston et al., 2020). An essential piece of information in doing so is that, from the perspective of parents and professionals, investing in gaming equipment (PCs, game consoles, motion-controlled applications) is seen as a very effective

strategy to facilitate the participation of children with disabilities in society with their non-disabled peers (Steinhardt et al., 2021).

5. Limitations

This paper contains several limitations. First, the desk research analysis (excluding electronic sources) was based only on three scientific databases: PubMed, ResearchGate and Taylor and Francis Online. The failure to include other bibliographic databases in the analysis prevented the acquisition of other scientific publications potentially valuable to the analysis. However, this procedure was intentional, as the author cared about the same databases used in the first place. In continuing the thread of gaming in the context of people with disabilities, the author plans another publication soon - this time using other scientific databases. Secondly, the author is aware of the lack of inclusion of references to all types of disabilities in work. Such a step leaves room for analysis in subsequent studies. Finally, the identified gaming and virtual reality developments certainly do not exhaust the topic and contribute to further in-depth research in this area.

Despite the identified limitations of the paper, this article could form the basis for further complementary research in the future. Besides, a new survey could include the opinions of players with disabilities on accessible facilities - based on the author's CAWI survey.

6. Conclusions and recommendations

Despite the many benefits of gaming for people with disabilities, there are still not enough improvements for such players. The existing facilities for gamers with disabilities are insufficient for all types of disabilities and disorders. Therefore, access to many games for such groups is still a roadblock.

Besides, the topic of disability in games is still not enough. In their report, this situation is pointed out (Stasieńko et al., 2021). Despite showing characters with disabilities in games, they are "fixed" by futuristic implants, prostheses and exoskeletons. According to the authors above, characters with disabilities rarely appear in sports games, and there are practically no games with sports dedicated to people with disabilities. Finally, game designers often avoid the topic of disabilities in games. They do this to avoid offending the disability community by introducing unacceptable, schematic characters into games. On the other hand, designing elaborate disability mechanics requires more work, financial investment, and a non-standard approach to its creation.

Identifying barriers among players with disabilities can significantly contribute to improving practices in designing and developing educational games and can support the learning process. According to the study (Stankova et al., 2021), the three most severe barriers to accessing games among children with learning disabilities are the cost of the game, the lack of games that have severe educational and therapeutic effects, and the lack of information about access to quality games. Game designers should bridge the barriers above to increase the accessibility of games to excluded social groups.

As part of the recommendations, the author points to the phenomena of inclusivity and diversity in games, i.e. opening up to an increasingly wide range of players - without dividing them by gender, ethnicity, cultural background or type of disability. In the context of this approach, game designers should increasingly include the possibility of personalizing characters with different skin colours or body sizes, narratives related to culturally diverse characters, support for players with various disabilities and disorders, and healthy communication during gameplay.

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