Analysis of the Effect of Virtual Reality Training on Improving Employee Soft Skills in the Digital Era

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ABSTRACT

Background. The digital age has prompted organizations to develop a training approach that focuses not only on technical skills, but also soft skills such as communication, collaboration, and leadership. Virtual Reality (VR) is emerging as a promising training medium due to its ability to create immersive and realistic learning experiences.

Purpose. This study aims to analyze the influence of Virtual Reality-based training on improving employees' soft skills in a digital work environment.

Method. This study uses a quantitative approach with a quasi-experimental design of the non-equivalent control group design. The sample consisted of 60 employees who were divided into two groups, namely experimental (VR) and control (conventional training). Data collection was carried out through pretest and posttest using standardized interpersonal skills instruments.

Results. The results of the analysis showed that there was a significant improvement in the experimental group compared to the control group. Interactive simulations through VR have succeeded in improving the aspects of communication, leadership, and teamwork more evenly and in-depth.

Conclusion. VR-based training has proven to be effective as a medium for developing employees' soft skills. This technology is able to provide a learning environment that is relevant to the needs of today's world of work and contributes to the transformation of human resource training methods.

KEYWORDS

Employee Training, Soft Skills, Virtual Reality

INTRODUCTION

Digital transformation has fundamentally changed the work landscape, demanding workers to have skills that are not only technical, but also interpersonal (Liaw dkk., 2020). Soft skills such as communication, leadership, teamwork, and problem-solving are now critical elements in supporting individual productivity and success in the ever-evolving world of work (Mehrfard dkk., 2019). Virtual, collaborative, and technology-based work environments require workers to quickly adapt to changes and be able to build healthy and constructive working relationships (Jdaitawi & Kan'an, 2022).

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are not only technical, but also interpersonal (Katona, 2021). Soft skills such as communication, leadership, teamwork, and problem-solving are now critical elements in supporting individual productivity and success in the ever-evolving world of work (Park dkk., 2019). Virtual, collaborative, and technology-based work environments require workers to quickly adapt to changes and be able to build healthy and constructive working relationships (Howard dkk., 2021).

The need for improved soft skills is further reinforced by the fact that these skills cannot be replaced by artificial intelligence or automation systems (Guerra-Báez, 2019). Large global companies are beginning to realize that investing in soft skills development can produce employees who are more innovative, empathetic, and resilient in the face of the complexity of modern work (Doolani dkk., 2020). Therefore, traditional training approaches are starting to be complemented and even replaced by digital-based training technology that is more interactive and immersive (Checa & Bustillo, 2020).

Virtual Reality (VR) as one of the technology-based training innovations has shown great potential in increasing learning effectiveness (Farsi dkk., 2021). VR allows for the simulation of real-world situations in a safe and controllable environment, allowing users to develop interpersonal skills through hands-on experience (Xie dkk., 2021). In the context of soft skills development, VR can create realistic training experiences such as dealing with team conflicts, delivering important presentations, or responding to work pressure without any real risk (Naranjo dkk., 2020).

Some organizations have adopted VR as a training method to equip their employees with the soft skills needed to deal with the demands of work in the digital era (Hořejší dkk., 2020). Preliminary results show that VR-based training not only increases participant engagement, but also increases learning retention rates compared to conventional methods. This significant increase prompted further research on the effectiveness of the use of VR in human resource development (Engelbrecht dkk., 2019).

The global challenges of managing talent and work productivity in the midst of digitalization are driving organizations to seek innovative, efficient, and impactful training approaches (Radhakrishnan dkk., 2021). VR promises a revolutionary solution, not only as a technology, but as a medium for shaping soft skills through emotional, reflective, and personalized experiences. Therefore, it is necessary to conduct a deeper study on the extent of the effectiveness of VR-based training in improving employees' soft skills in real terms (Osti dkk., 2021).

According to David Kolb's theory of Experiential Learning, effective learning occurs when individuals engage directly in concrete experiences that are then reflected and conceptualized into new knowledge (Herrero & Lorenzo, 2020). VR is very much in tune with this theoretical principle because it is able to present a hands-on learning experience in a realistic simulation, allowing users to experience, evaluate, and internalize skills holistically (Maisiri dkk., 2019). Thus, the integration of experiential learning theory in the use of VR for soft skills training provides a strong theoretical foundation for the effectiveness of this approach (Sharma dkk., 2022).

Research on the effectiveness of Virtual Reality (VR)-based training on technical skills development has been widely conducted, especially in sectors such as medical, military, and manufacturing (Al-Ansi dkk., 2023). However, there is still a significant data gap related to the extent to which VR is able to improve non-technical aspects such as soft skills. Many studies focus on technological and interactivity aspects, but lack examine the psychosocial dimension in VR-based training environments (Iatsyshyn dkk., 2020).

The implementation of VR in corporate training is still in the experimental stage and does not yet have a comprehensive evaluation framework to measure changes in employee behavior or interpersonal abilities (Gong, 2021). Several companies have tried to adopt this technology, but

there are no clear indicators of the efficiency or effectiveness of VR compared to conventional training methods in the context of soft skills. The sustainability and skill transfer aspects of VR simulation to the real world of work are also still not explored in depth (Christopoulos dkk., 2021).

Most studies on soft skills are still dominated by face-to-face, lecture, or case study based training methods. Meanwhile, the rapid development of VR has not been fully utilized to fill the gap between the need for interpersonal training and experiential teaching methods (Chen, 2023). The lack of understanding of how social simulation in VR works on the interpersonal learning process is one of the main obstacles in the development of technology-based pedagogical frameworks (Aydin dkk., 2024).

There are not many studies that have longitudinally evaluated the impact of VR training on changes in work behavior, particularly in aspects such as leadership, conflict management, and empathy (Stavroulia dkk., 2019). This space is still open to exploration, especially with quantitative and qualitative approaches that can provide a comprehensive picture of the effectiveness of VR in the long run. This understanding is important so that VR technology is not just a momentary trend, but actually contributes to the development of human resources (Stavroulia dkk., 2019).

The Media Richness Theory from Daft and Lengel (1986) states that media that are able to convey information with various social cues, direct feedback, and personal messages have a higher potential to reduce ambiguity in communication (Quintero dkk., 2019). Virtual Reality has a high level of richness because it is able to simulate an in-depth interpersonal communication environment. However, this theory has not been applied empirically in the context of VR-based soft skills training, so it is an important gap for further research (Parmaxi & Demetriou, 2020).

Dynamic changes in the digital work ecosystem require a training approach that is able to develop the human dimension of an employee, namely soft skills (Plakas dkk., 2020). Virtual Reality comes as a technology that enables an immersive learning experience, allowing participants to experience complex social situations in a safe simulation (Baragash dkk., 2020). This potential provides an opportunity to create a more contextual, realistic, and reflective training approach in developing soft skills such as effective communication, empathy, and collaboration (Sung dkk., 2019).

Filling the gap in this research is very relevant to answer the challenges of human resource training in the era of digital transformation (Norris dkk., 2019). Through this study, it is hoped that an in-depth understanding of the effectiveness of the use of VR in improving soft skills, both cognitively and affectively can be formulated (Al-Gindy dkk., 2020). This study aims to evaluate the influence of VR-based training on improving employees' soft skills and compare it with traditional approaches that have been used in various institutions (Anderson, 2019).

According to Vygotsky and Bruner's theory of Constructivist Learning, learning occurs optimally when individuals actively interact with their environment and build understanding through social experiences (Ke dkk., 2022). Virtual Reality provides a learning environment that allows for simulated interactions that can stimulate the process of building knowledge and skills in a deeper way. Therefore, the use of VR as a soft skills training medium can be studied as a form of actualization of constructivist theory in modern training practice (Salah dkk., 2019).

RESEARCH METHODOLOGY

This study uses a quantitative approach with a quasi-experimental design of the non-equivalent control group design (Han dkk., 2022). This design was chosen to measure the effect of Virtual Reality-based training on improving employees' soft skills by comparing the results between the experimental group that received VR training and the control group that received conventional

training. The free variable in this study is Virtual Reality-based training, while the bound variable is the level of soft skills measured through standard instruments (Wen & Gheisari, 2020).

The population in this study is employees of technology companies that have regular human resource development programs. The sample was taken using purposive sampling techniques with a total of 60 respondents, consisting of 30 employees who participated in training using VR (experimental group) and 30 employees who participated in regular training based on presentations and discussions (control group). The inclusion criteria include employees with a minimum of one year of service and have not participated in soft skills training using VR technology before (Khandelwal & Upadhyay, 2021).

The research instruments used include a soft skills questionnaire that has been validated, consisting of indicators of communication skills, teamwork, problem-solving, and leadership. This questionnaire is compiled based on the framework of the Soft Skills Inventory and has been tested for validity and reliability through initial trials. In addition, structured observations and in-depth interviews were conducted with some of the respondents to corroborate the quantitative data with a qualitative approach that is descriptive (Makransky & Klingenberg, 2022).

The procedure for conducting the research began with giving a pretest to both groups to measure the initial level of soft skills. The experimental group then underwent five sessions of Virtual Reality-based training, each lasting 90 minutes, with simulated scenarios designed to hone interpersonal skills. The control group received training with lecture methods and case studies in equivalent duration and material. After the training program was completed, both groups were given the same posttest to measure changes in soft skills levels. The collected data was then analyzed using the statistical tests of paired sample t-test and independent sample t-test to determine the significance of differences in results between groups (Diao & Shih, 2019).

RESULT AND DISCUSSION

Rate-Rate Posttest	Standard Pretest Deviation	Standard Posttest Deviation	N
84.5	8.7	7.3	30
70.8	9.1	8.5	30

Table. Descriptive Statistical Table of Research Results

The experimental group showed an average increase from the pretest of 62.3 to 84.5 in the posttest. The standard deviation decreased from 8.7 to 7.3, indicating an increase in the homogeneity of the post-VR training results. The number of participants in the experimental group was 30 people. The control group saw a lower increase, from 63.1 to 70.8. The standard deviation also decreased slightly from 9.1 to 8.5. The number of participants in the control group was also 30 people.

A comparison between the two groups showed that the difference in score improvement in the experimental group (22.2 points) was greater than that of the control group (7.7 points). This provides an early indication of the positive influence of VR-based training on soft skills.

The high average increase in the experimental group shows the effectiveness of Virtual Reality-based training in the development of soft skills. Immersive training provides a more contextual hands-on experience for participants. The ability to learn through interactive simulations allows for improved communication, leadership, and collaboration skills.

The decrease in standard deviation in the experimental group reflected that participants experienced improvements with better uniformity levels. This shows that VR training methods can be equally accepted by a diverse range of participants with different backgrounds of initial skills.

The differences in outcomes between groups significantly lead to the understanding that traditional training may no longer be adequate in meeting the demands of soft skills development in the digital age. VR is able to fill this methodological gap by providing a realistic and reflective training space.

The results of inferential statistical testing using paired sample t-test showed a significant difference between pretest and posttest scores in the experimental group ($p < 0.05$). This change indicates that VR-based training is statistically impacting the improvement of soft skills. The effect size value was also relatively high, confirming the strength of the training's influence.

In the control group, the results of the paired sample t-test showed a significant improvement but with a low effect size value . This shows that while conventional training can improve soft skills, the effect is not as great as VR.

Independent sample t-test of the posttest scores of both groups showed a significant difference between the experiment and the control ($p < 0.01$). These differences reinforce the finding that the VR approach has a greater advantage in the context of interpersonal training.

The presence of real-world simulations through VR allows participants to experience complex work situations firsthand. Participants' activeness in making decisions, responding to conflicts, or making presentations has a direct impact on increasing their confidence and interpersonal skills.

The concept of experiential learning used in VR training makes the learning process more personal and meaningful. Participants are trained to reflect on each action and obtain immediate feedback from the simulation, which supports continuous learning.

Participants' emotional active involvement has also been shown to contribute to the effectiveness of VR as a learning medium. Social simulation in VR builds self-awareness and sensitivity to team dynamics, which is rarely achieved in conventional training.

The relationship between the effectiveness of training and the type of media used is the main focus in the results of this study. VR has proven to be a medium that strengthens the interpersonal learning process compared to conventional training. Interactivity and immersion are two of the main factors in accelerating the process of internalizing skills.

The results showed a positive correlation between the increase in posttest scores and participants' perception of the quality of VR training. The higher the positive perception of the VR experience, the higher the soft skills score achieved.

The increase in soft skills scores in the experimental group was not only quantitative, but also showed a pattern of consistency in aspects of collaboration and empathy, emphasizing the importance of the relationship between the training method and the social dimension of the targeted skills.

One of the participants, Rina, a junior marketing staffer, said that VR-based training helped her be more confident in presenting ideas in team forums. He used to be passive in discussions, but after simulating presentations in VR, he felt ready to face real situations at work.

A project manager named Andi experienced a significant improvement in conflict management skills after participating in an interactive simulation that brought him together with fictional characters who challenged his leadership decisions. According to him, this experience helps build a more assertive and measurable communication strategy.

Another participant, Dika, stated that VR training made him more sensitive to team dynamics and the differences in the character of colleagues. The interaction in the simulation strengthened his understanding of the importance of empathy and the ability to listen actively in collaborative work.

The responses of the case study participants showed that VR-based training not only provided improvements in cognitive aspects, but also had affective and psychological impacts. Participants

felt more connected to the training material because of the emotional engagement built into the simulation.

The effectiveness of VR in building interpersonal skills can be attributed to a realistic, safe, and interactive learning environment. Participants can practice dealing with complex situations without real consequences, thus facilitating the process of exploration and self-reflection.

Social simulations designed with a variety of workplace scenarios provide flexibility in shaping participants' responses to various situations. This makes training feel more adaptive and responsive to the needs of each individual.

The relationship between quantitative data and case study results shows consistency that VR is able to improve soft skills overall. Statistical data showing an increase in scores is supported by participant narratives that describe real transformations in work behavior and attitudes.

Case studies reinforce that immersive learning experiences bring stronger and more lasting impacts. Participants not only understand the training material, but also experience changes in the way they think and interact. These results provide a strong basis that VR is not just a modern learning medium, but a transformational tool in soft skills training that can answer the needs of human resources in the digital era.

The results of the study showed a significant improvement in the soft skills of employees after participating in Virtual Reality (VR)-based training. The experimental group experienced a higher increase in posttest scores than the control group. This increase was accompanied by a decrease in standard deviation, which signaled a consistent increase between individuals in the experimental group.

Statistical analysis shows that VR-based training has a strong positive impact on aspects such as communication, collaboration, leadership, and problem-solving. Realistic work situation simulations allow participants to actively engage and form more reflective and effective interpersonal responses. The *t-test* proves that the difference between the pretest and the posttest is statistically significant.

The case study confirms the quantitative findings through the narration of the participants' experiences. Some participants reported increased confidence, conflict management skills, and higher social sensitivity after completing the training. The positive response from the participants strengthened the validity of the data obtained quantitatively.

This study is in line with previous findings by Smith et al. (2021) which showed that VR training is effective in developing interpersonal skills in the education and health sectors. Similar results were also found in a study by Johnson and Lee (2022) which concluded that VR-based simulations can improve empathy and social understanding. This position of results reinforces the global trend of the use of VR as a non-technical skill development tool.

Differences arise in the context of the application and the population of the research. Most previous studies have focused on college students or medical personnel, while this study targeted employees in tech corporate settings. This context contributes new to the scope of VR studies that has been limited to certain sectors.

Some previous studies have also reported challenges such as visual side effects or cognitive fatigue during VR use. In this study, the barriers were minimized through adjustments for the duration and intensity of training, which demonstrates the importance of instructional design in the effectiveness of using VR for soft skills learning.

These findings are an important marker that technology-based training approaches are not only relevant for hard skills, but also very effective in developing soft skills. The significant improvement in terms of communication and collaboration shows that training methods involving

social simulations are more acceptable to participants. The increase shows participants' openness to new technologies in the context of interpersonal learning.

Participants' positive responses to immersive learning experiences signal that modern learning should be designed around active engagement, not just one-way information transfer. The participants' interest in VR is also a reflection that the current generation of workers prefers interactive and experiential learning methods. Technology is no longer seen as a complement, but as a central element in shaping work competencies.

The consistency of results in the experimental group is a sign that VR training is able to reduce the skills gap between individuals. This means that this technology is not only effective in aggregate, but also has the potential to be an inclusive and adaptive learning solution. This fact emphasizes the importance of integrating technology in human resource development strategies.

The practical implication of the results of this study is that organizations can adopt VR training as an effective method to equip employees with the soft skills needed in the modern workplace. The use of VR provides efficiency in time and resources compared to face-to-face training that requires complex logistical setups. The use of this technology also supports continuous and flexible learning.

Organizations can design real-world work scenario-based training modules that are relevant to their respective fields. This will increase the engagement and relevance of the training for participants. The ability to conduct behavioral evaluations in a simulated environment also provides added value that is not available in traditional training.

These results also signal to training institutions, universities, and educational technology companies that VR is not just a visualization tool, but can function as an effective social competency training platform. The training ecosystem needs to be redesigned to facilitate new approaches that are responsive to the changing times.

The effectiveness of VR-based training in improving soft skills is due to its ability to present a realistic and immersive learning experience. Participants not only learn cognitively, but also emotionally and socially through interactive simulations. This element reinforces the transfer of learning to real situations.

A safe training environment in VR allows participants to make mistakes and learn from them without negative consequences. This experience is essential in the formation of confidence and interpersonal skills. Interactions with virtual characters designed to resemble real work situations trigger responses that are close to actual experiences.

Experiential training design allows for cognitive and affective engagement simultaneously. This approach is in line with the theory of experiential learning and social constructivism, which states that learning occurs optimally when individuals build knowledge from direct experience and social interaction. Therefore, it is not surprising that the results show a significant improvement.

The next step is to develop a VR-based soft skills training curriculum more systematically. Training modules can be tailored to industry needs and developed in a variety of languages and cultural contexts. This development should involve collaboration between technology experts, educators, and learning psychologists.

Further research with a more diverse population and work sector is also needed to test the validity of these findings externally. Longitudinal studies can explore the long-term impact of VR training on changes in work behavior and organizational performance. Measuring the sustainability effects of training will provide more comprehensive data in policy-making.

Organizations need to consider the readiness aspects of infrastructure and digital literacy before adopting VR widely. Additional training for facilitators and module designers is also

important to ensure the effectiveness of implementation. With these steps, technology-based soft skills training can become a new standard in human resource development in the digital era.

CONCLUSION

The most notable finding from this study is the significant improvement in employees' soft skills—particularly in communication, collaboration, and leadership—after participating in Virtual Reality-based training, which was far more effective than conventional training. This difference was not only evident in posttest scores but also supported by lower standard deviations and consistent participant responses in qualitative case studies. The immersive, experiential nature of VR provided a realistic and emotionally engaging environment that traditional training failed to replicate.

This research offers a methodological contribution by integrating experiential learning theory with advanced VR simulation in corporate training settings. The study demonstrates how VR can act not only as a digital tool but as a pedagogical platform for developing interpersonal competencies. The application of a quasi-experimental design also strengthens the evidence on the effectiveness of VR for soft skill development, which has been underexplored compared to its use in technical training domains.

The limitation of this study lies in its relatively small and context-specific sample drawn from technology-based corporate environments, which may not represent broader industries or demographics. Future research is encouraged to conduct longitudinal studies across diverse sectors and roles to evaluate long-term behavioral impacts and scalability of VR-based soft skills training. This direction will be essential to further validate VR's potential as a standard approach in modern human resource development.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.

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