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Metaverse in Human Resources: Proposed Applications for Telecommunications Companies in Riyadh, Saudi Arabia

Raghad Salman Al Othman
Department of Public Administration, College of Business Administration, King Saud University, P.O. Box 71115, Riyadh 11587, Saudi Arabia

Prof. Othman Ibrahim Al Salloum
Department of Management Information System, College of Business Administration, King Saud University, P.O. Box 71115, Riyadh 11587, Saudi Arabia.

Abstract
This study explores the potential of metaverse technologies to transform Human resources practices at telecommunications companies in Riyadh, Saudi Arabia. Utilizing a quantitative approach with questionnaire data from 116 employees, the research examines the relationship between metaverse awareness, perceived effectiveness, and acceptance of these technologies in recruitment, onboarding, training, and performance management. Key findings include a positive correlation between metaverse awareness and perceived effectiveness in recruitment and onboarding, a strong link between perceived VR training effectiveness and support for implementation, and a negative correlation between privacy concerns and acceptance of metaverse technologies for performance management. Age influences perceptions, with younger employees being more receptive. The study provides a practical roadmap for metaverse adoption in HR, contributing to Saudi Arabia's Vision 2030 objectives.
Keywords: Metaverse, Human Resource Management, Virtual Reality, Augmented Reality, Digital Transformation, Saudi Arabia.
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1. Introduction

The metaverse, a burgeoning ecosystem integrating immersive technologies like virtual reality (VR), augmented reality (AR), and extended reality (XR), is poised to revolutionize the global work landscape (Mystakidis, 2022). This transformation is particularly salient in Saudi Arabia, a nation undergoing rapid digital evolution. The metaverse's promise of immersive and interconnected virtual environments offers unprecedented opportunities for businesses to reimagine traditional work paradigms, driving productivity while potentially reducing operational costs (Lee et al., 2021). In alignment with Saudi Arabia's ambitious Vision 2030, which champions digital transformation, economic diversification, and the development of a knowledge-based economy, the Kingdom's technology sector has witnessed a surge in the adoption of metaverse-related technologies (Saudi Vision 2030, 2020). This strategic focus on technological advancement is not merely a trend but a critical component of the nation's long-term development plan.

The rise of remote work, accelerated by global shifts and the recent COVID-19 pandemic, has further underscored the need for innovative solutions that enhance communication, collaboration, and employee engagement in virtual settings (Brynjolfsson et al., 2020). The deepening exploration of VR/AR/XR technologies, fueled by the widespread adoption of the internet and the necessity for remote work solutions, has created a fertile ground for metaverse applications (Riva et al., 2019). However, while the technological potential is evident, the practical implementation of metaverse solutions within specific organizational contexts, particularly in the realm of Human Resources (HR), remains an area ripe for exploration.

This research investigates the potential of metaverse technologies to bridge the gap between emerging digital environments and their practical application within a leading telecommunications organization in Riyadh, Saudi Arabia. Specifically, it focuses on the implementation of metaverse applications within human resources functions, including recruitment, onboarding, training, employee engagement, and performance management. Furthermore, this study addresses the critical need to understand how these technologies can be effectively integrated within the unique cultural and regulatory context of Saudi Arabia (Al-Rasheed, 2018). By proposing

tailored metaverse applications for telecommunications companies, this research aims to provide a practical roadmap for other organizations within the Kingdom seeking to leverage the transformative power of the metaverse.

This paper will not only examine the theoretical potential of the metaverse in HR, but also provide actionable recommendations for telecommunications companies, demonstrating how they can utilize these technologies to foster a more engaged, efficient, and future-ready workforce (Dionisio et al., 2013). Ultimately, this research contributes to the broader discourse on digital transformation in Saudi Arabia and provides a valuable case study for organizations worldwide navigating the evolving landscape of work in the metaverse era.

2. Theoretical Framework and Hypothesis Development

This study describes the intersection of the metaverse and human resources (HR) as it examines how VR, AR, and XR are transforming how HR operates in telecommunications companies in Saudi Arabia. As Telecommunications Companies In Riyadh navigate the digital transformation outlined in Saudi Vision 2030, the adoption of metaverse technologies in HR practices can unlock new levels of efficiency and employee engagement. To steer this exploration, it is important to rely on a powerful theoretical foundation that includes central notions and significant theories.

First, it is important to establish what we mean in this study regarding the core elements. The metaverse can be described as a collectively shared space that encompasses both digital and physical realities, including virtual worlds, augmented reality, and the internet. VR/AR/XR are the types of technology that power this metaverse: VR takes users into fully simulated environments, AR superimposes digital content onto the physical environment, and XR is an umbrella term for all immersive tech. To help us make sense of the adoption and impact of these technologies, established theories help. The Technology Acceptance Model (TAM) posits that IT adoption is mainly driven by perceived usefulness and ease of use. Now, let us take a look at how all of this impacts the implementation of VR/AR/XR in the company's HR department. While TAM serves as a foundational framework, other frameworks, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), add complexity by integrating constructs such as social influence, facilitating conditions, and hedonic motivation. These can be beneficial for understanding technology adoption in Saudi Arabia's distinctive cultural and technological landscape. Additionally, Social Cognitive Theory presents observational learning, self-efficacy, and social reinforcement as driving forces in learning and altering behavior. This theory will be vital in interpreting how immersive VR/AR/XR aspects can aid in employee training and development. Finally, the Media Richness Theory proposes that communication channels differ in terms of their carrying capacity and level of understanding.

2.1 The relationship between metaverse awareness and perceived effectiveness of metaverse technologies for recruitment and onboarding

Virtual reality has also made significant inroads in recruitment and onboarding. Studies like De Lange et al. (2020) show that VR job previews can provide a more optimal recruitment experience by offering a realistic preview of the job, thereby enhancing candidate attraction and fit with the role. For example, virtual office tours offered through VR enable prospective employees to immerse themselves in company culture and workspace, regardless of geography (Gartner reports VR in recruitment). Moreover, AR applications are being used to enhance onboarding processes by deploying interactive guides and providing real-time information to new employees (Huang et al., 2022). In the recruitment process, realistic job previews (RJPs) help applicants self-select by providing a balanced portrayal of job characteristics. Roulin & Levashina's (2019) meta-analysis highlights the effectiveness of RJPs in communicating accurate job information. Metaverse technologies can further facilitate this self-selection process by offering immersive virtual experiences that allow applicants to better assess their fit with the organization and the role.

H1: There is a correlation between employees' awareness of the metaverse and their perceived effectiveness of metaverse technologies for recruitment and onboarding at Saudi Telecommunications Companies.

2.2 The relationship between employees' perceived effectiveness of VR training simulations and their level of agreement towards implementing metaverse technologies for training and development.

VR/AR/XR technologies are also playing an important role in training and development. Many studies have found that incorporating video into learning, including Salas et al. (2012), demonstrate that VR training simulations provide employees with a safe and engaging environment to develop new skills and internalize complex behaviors. The real-life-like scenario-based training helps students experientially learn, leading to better retention of information and, in turn, increasing their performance. Additionally, studies evidence the role of social interaction in VR training, as experiences in a virtual environment shared between participants lead to greater learning outcomes (Bailenson et al., 2008). VR offers several benefits for learning and training, including increased engagement and the ability to create immersive experiences. Radianti et al. (2020), in their systematic review of VR in higher education, highlight the potential of VR to enhance learning outcomes and emphasize the importance of specific design elements for effective implementation. Their review suggests that interactive scenarios, learner control, and clear learning objectives are crucial for maximizing the benefits of VR in learning. These advantages and design considerations make VR a valuable tool for HR training programs, where it can be used to deliver engaging and effective learning experiences. Meyer, Kim, and Leite (2019) conducted an experimental study on the impact of virtual reality (VR) training on hazard recognition and safety behavior within the construction industry, exploring the effectiveness of VR simulations as a training tool for improving safety outcomes. Their research demonstrated that VR training led to significant improvements in participants' ability to identify hazards and respond safely compared to traditional training methods, highlighting VR's potential to create immersive and engaging safety training experiences that can lead to measurable enhancements in safety performance. AR applications are also being piloted for on-the-job training and performance support, allowing for real-time information and guidance for employees (Webel et al., 2013).

H2: Employees' perceived effectiveness of VR training simulations is associated with their level of agreement towards implementing metaverse technologies for training and development.

2.3 The relationship between employees' concerns about privacy and data security in the metaverse and their level of agreement towards implementing metaverse technologies for performance management.

The VR/AR integration is also affecting performance management. Studies like Pan et al. (2021) explore the application of VR in performance evaluation and feedback, describing an assessment method that can be more objective and holistic. AR-Enhanced Performance Monitoring and Coaching: Companies are developing AR-enabled tools for performance monitoring and coaching, offering real-time feedback and personalized support (Porter & Heppelmann, 2017). Such technologies can revolutionize individual performance management processes to be more data-driven and effective. Research indicates that such virtual encounters can improve employee morale and engagement (Hall et al., 2024). Team communication in the Metaverse can help remote teams connect, collaborate, and work together more effectively. An example of how effective VR can be in training is Walmart, which has emerged as a leader in utilizing virtual reality (VR) technology for employee training and development, providing useful insights for enterprises looking to harness the power of immersive learning environments. The announcement in 2018 that the company intended to train one million workers using VR (Corporate. Walmart. com, 2018) was a bold move that showcased the company's understanding of VR's ability to improve knowledge retention, employee engagement, and customer service. This bodes well for the enterprise AR/VR agenda, and PwC's "Seeing is Believing" report is a great primer on the exciting potential of these media in the workplace. Enhanced employee training and development for the long term represent significant potential economic benefits that these technologies can provide. VR and AR systems can significantly increase engagement, retention of knowledge, and speed of skill acquisition by developing immersive training scenarios. Other research into the effectiveness of VR/AR training supports these findings, with a similar positive effect being noted on learning outcomes and employee performance (PwC, 2019). XR technologies can dramatically change the way we work (XR Today, 2023) and enable the plethora of ways we can collaborate (music/jam sessions), train (AR/metaverse), and utilize immersive work experiences (XR Today, 2023). This cannot imply the same scope for XR in professional practice. The advent of distributed working, driven by the recent global climactic events to come, brings highly ostracized demands for more innovative solutions to managing and facilitating a more distributed employee and workforce (Al-Shuaibi & Olfman, 2022). The metaverse presents a dynamic and automated virtual environment that can be the perfect antidotes to these concerns. In a related discussion, Lee (2022) argues that the metaverse will enable unique experiences that can be merrily engaging and immersive for employees, resulting in increased motivation and productivity in HR management. To better understand some of the implications of the metaverse on HRM, Pellas, and Kazanidis

(2023) introduce a conceptual framework emphasizing organizations needing to adjust their practices in this new digital environment. Bhaker and Sharma (2023) carried out a bibliometric examination of the literature available, outlining key themes including recruitment, onboarding, training, performance management, and employee engagement, and the efficacy of virtual reality to improve these practices. VR/AR/XR technologies can disrupt processes such as recruiting, onboarding, training, collaboration, customer service and employee engagement, allowing for innovation and growth within the Kingdom's fast-developing technology space. Nonetheless, further study is required to explore context-specific challenges and opportunities related to implementing the metaverse in the Saudi Arabian context specifically in telecommunications companies.

This study will investigate the potential of the Metaverse to enhance HR practices in Saudi Arabia, addressing key gaps in existing research by examining the effectiveness of VR/AR/XR technologies in Saudi workplaces. It will explore the cultural and social factors influencing Metaverse adoption in the Kingdom, focusing on telecommunications company Based in Riyadh. The research will analyze the challenges and opportunities associated with implementing specific Metaverse-based HR practices, such as: 1) immersive onboarding programs that accelerate learning and foster a sense of belonging among new hires; 2) enhanced customer service training through VR simulations that improve employee performance and customer satisfaction; and 3) virtual collaboration hubs that strengthen team cohesion and communication across a geographically dispersed workforce. By analyzing these tailored applications, the study aims to provide a practical roadmap for leveraging the Metaverse to support the future of work in Saudi Arabia, aligning with the goals of Saudi Vision 2030 to promote technological advancement, develop a skilled workforce, and enhance the competitiveness of telecommunications companies.

H3: There is a correlation between employees' concerns about privacy and data security in the metaverse and their level of agreement towards implementing metaverse technologies for performance management.

2.4 The relationship between employees' age and years of experience at Telecommunications Companies and their overall thoughts and expectations regarding the use of metaverse technologies in HR practices.

While the metaverse presents significant opportunities to transform HR practices, its practical implementation within specific organizational contexts remains largely unexplored. This is particularly true in Saudi Arabia, where the unique cultural and regulatory landscape necessitates careful consideration of how these technologies can be effectively integrated. Therefore, this research aims to address this gap by investigating the potential applications of metaverse technologies within Saudi Telecommunications Companies, examining the specific challenges and opportunities associated with their implementation in this context.

H4: Employees' age and years of experience at Telecommunications Companies are associated with their overall thoughts and expectations regarding the use of metaverse technologies in HR practices.

3. Methodology

This study employed a quantitative research design using a questionnaire to investigate the potential applications of metaverse technologies in HR practices at telecommunications companies. Quantitative research, with its structured data collection, allows for broader reach and statistical analysis, complementing the qualitative insights from the literature review.

3.1 Research Tool

The primary research tool was a structured questionnaire to gather quantitative data on employee perceptions, expectations, and concerns regarding the use of metaverse technologies in HR practices at Saudi Telecommunication Companies. The questionnaire used a 5-point Likert scale for most questions, ranging from "Strongly Disagree" to "Strongly Agree," allowing for nuanced responses and quantitative analysis. The questionnaire is structured into four dimensions: Demographics includes questions about age, gender, role, department, and experience at telecommunications companies. Awareness and Understanding assesses familiarity with the metaverse concept and its relevance to HR functions through questions asking about the level of agreement with statements such as 'I am familiar with the concept of the metaverse.' Potential Applications in HR explored the perceived effectiveness of metaverse technologies in recruitment (e.g., 'VR job

simulations would be effective in attracting qualified candidates'), onboarding (e.g., 'A virtual onboarding program in the metaverse would help new hires learn about Telecommunications Companies faster'), and training and development (e.g., 'VR training simulations would be more engaging and effective than traditional training methods'). Benefits and Challenges examines perceptions of productivity improvements, employee satisfaction, technical challenges, privacy concerns, and cultural support.

3.2 Validity and Reliability

To ensure the validity and reliability of the research tool, exploratory factor analysis (EFA) was conducted using SPSS to assess the underlying dimensions of the questionnaire and ensure that the questions were measuring the intended constructs. Factor loadings were examined, and loadings of 0.5 or higher were considered acceptable, indicating that the items adequately represent their respective constructs. In addition, Cronbach's alpha was calculated to assess the internal consistency of the questionnaire items. A value of 0.7 or higher was considered acceptable, demonstrating strong internal consistency.

3.3 Research Population

The research population consisted of all employees in telecommunications companies in Riyadh, Saudi Arabia, including HR professionals, managers, and general staff across different departments and roles. This broad population provided a comprehensive understanding of the potential applications and implications of metaverse technologies in HR across the organization.

3.4 Research Sampling and Selection

A random sampling technique was used to ensure representation across different departments and roles from telecommunications companies specifically in Riyadh. This technique involves dividing the population into strata (e.g., departments, roles) and then randomly selecting participants from each stratum. The target sample size for this study was 384, which is the optimal number to achieve a 5% margin of error with a 95% confidence level. This sample size provided sufficient statistical power to test the research hypotheses and draw meaningful conclusions about the potential applications of metaverse technologies in HR practices.

3.5 Sources for Data Collection

The primary source of data for this study was the responses collected through the online questionnaire. The questionnaire was distributed electronically through Google Forms to ensure accessibility and anonymity. In addition to the questionnaire, secondary data was collected from various sources to provide context and support the findings. These sources include:

1. Industry publications and reports: Reports and analyses on the adoption and impact of metaverse technologies in the telecommunications and broader business landscape around the entire world.
2. Related literature: Research articles and books on metaverse technologies, HR practices, and Saudi Vision 2030 to provide a theoretical framework and empirical evidence.

3.6 Data Analysis

Data collected from the questionnaires were entered and analyzed using SPSS (Statistical Package for the Social Sciences) software and Amos. SPSS provides a comprehensive set of tools for statistical analysis, including descriptive statistics, inferential statistics, and data visualization. Data from closed-ended questions were analyzed using descriptive statistics (e.g., frequencies, means, standard deviations) and inferential statistics. Pearson correlation analysis was used to test H1, H2, and H3. ANOVA was used to test H4, and if significant differences were found, Tukey HSD post-hoc tests were conducted to determine which age groups differ significantly. Multiple linear regression analysis may be used to examine the influence of multiple variables simultaneously. Path analysis was conducted using AMOS to assess the structural relationships between key variables. Prior to conducting inferential statistical analyses, the assumptions of each test (e.g., normality, homogeneity of variance for ANOVA) were examined to ensure the validity of the results.

3.7 Ethical Considerations

Participation in the study was voluntary and anonymous. Informed consent was obtained electronically before respondents started answering the questionnaires. Data was stored securely and used only for research purposes.

4. Analysis

This section presents the findings of the study, based on the data collected from the questionnaire. Descriptive statistics, reliability and validity analyses, hypothesis testing results, and path analysis findings are reported.

4.1 Descriptive Statistics and Correlations

The study collected responses from 116 employees at telecommunications companies in Riyadh, comprising 29.3% males and 70.7% females. The age group distribution was determined using Sturges' rule to ensure appropriate categorization. With a sample size of 116, Sturges' formula [k=1+3.322log(n)] suggests approximately 7 age groups. It shows that the majority of participants are between 25-30 years old (61.2%), followed by 31-35 years old (22.4%), less than 25 years (11.2%), 36-40 years (4.3%), and 40+ (0.9%). The most common current roles/positions are Administration & Management (37.1%) and Human Resources (10.3%). The departments with the highest representation are Human Resources (13.8%) and Marketing & Communications (15.5%). The years of work experience are predominantly in the 0-2 years category (50.9%).

Table 1: Demographic Characteristics of Participants

Variable	Element	Frequency	Percent (%)
Gender	Male	34	29.3
	Female	82	70.7
Total		**116**	**100**
Age group	Less than 25	13	11.2
	25 - 30	71	61.2
	31 - 35	26	22.4
	36 - 40	5	4.3
	40 +	1	0.9
Total		**116**	**100**
current role/position	Administration & Management	43	37.1
	Business Development	2	1.7
	Consulting	3	2.6
	Education	1	0.9
	Engineering	5	4.3
	Finance & Accounting	13	11.2
	General Roles	9	7.8
	Healthcare	1	0.9
	Human Resources	12	10.3
	Internal communication	1	0.9
	Internship & Trainee	2	1.7
	IT & Software	5	4.3
	Legal	1	0.9
	Marketing & Communications	4	3.4

	Procurement & Supply Chain	2	1.7
	Specialist Roles	12	10.3
Total		**116**	**100**
department	Assets Management	1	0.9
	Consulting	8	6.9
	Corporate Governance	2	1.7
	Customer experience & Consumer enablement	4	3.5
	Defense & Security	2	1.7
	Design & Creativity	4	3.4
	Education & Training	2	1.7
	Finance & Accounting	14	12.1
	Government & Public Sector	3	2.6
	Healthcare	3	2.6
	Human Resources	16	13.8
	IT & Security	9	7.8
	Legal & Compliance	3	2.6
	Marketing & Communications	18	15.5
	Operations & Logistics	2	1.7
	Procurement & Supply Chain	2	1.7
	Project Management	4	3.4
	translation & Localization	1	0.9
	Real estate	1	0.9
	Research & Development	3	2.6
	Risk Management	1	0.9
	Strategy & Business Development	9	7.8
	Technology & Engineering	4	3.4
	Total	**116**	**100**
Years of work experience	0 - 2	59	50.9
	3 - 5	32	27.6
	6 - 10	20	17.2
	10 +	4	3.4
Total		**116**	**100**

The analysis of responses based on a five-point Likert scale indicated a moderate to high agreement on the potential of metaverse technologies in HR. The general trend for HR functions and its relation to Metaverse was "Moderate" with a mean of 3.47, while the general trend for potential benefits and challenges of implementing metaverse technologies in HR was "Agree" with a mean of 3.78.

Figure 1: Distribution of Participants by Gender

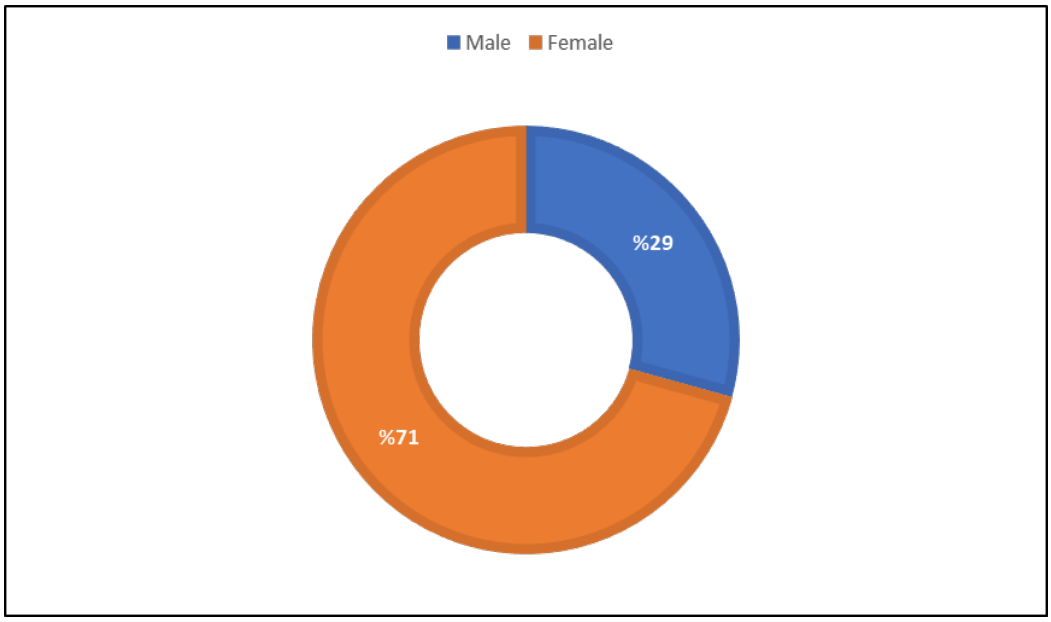
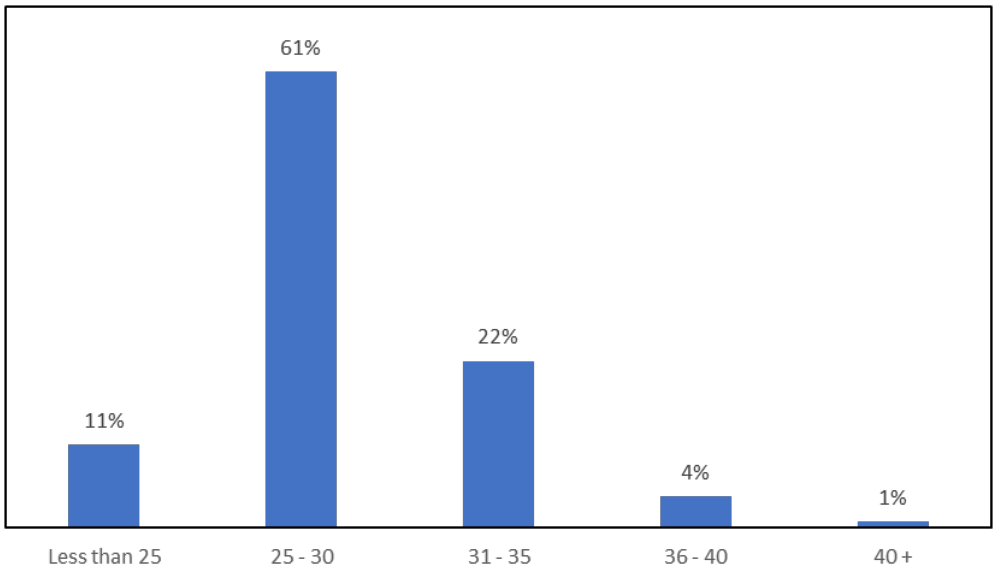


Figure 2: Age Group Distribution



Overall, the demographic data reveals a workforce with a notable representation of younger employees, who generally express moderate to high agreement regarding the potential of metaverse technologies within HR.

Table 2. Descriptive Statistics of HR functions and its relation to Metaverse

Items	N	Mean	Std. Deviation	Trend
7. Metaverse-based onboarding could reduce the time and resources required for new hire orientation	116	3.84	.874	Agree
6.A virtual onboarding program in the metaverse would help new hires learn about the company faster	116	3.80	.897	Agree
9. Metaverse-based training could provide a safe and controlled environment for employees to practice new skills	116	3.77	.868	Agree
5. Virtual interviews in the metaverse could improve the candidate experience	116	3.66	.950	Agree
4. VR job simulations would be effective in attracting qualified candidates	116	3.53	.955	Moderate
8. VR training simulations would be more engaging and effective than traditional training methods	116	3.50	1.000	Moderate
3. I believe that metaverse technologies are relevant to HR functions	116	3.22	1.014	Moderate
1.I am familiar with the concept of the metaverse	116	3.09	1.241	Moderate
2. Metaverse technologies are currently being used effectively at telecommunication companies	116	2.81	1.095	Moderate
General trend	**116**	**3.47**	**0.654**	**Moderate**

Table 2 presents the descriptive statistics of HR functions and its relation to the Metaverse. The general trend shows a moderate level of agreement (mean=3.47, SD=0.654) among the participants regarding the relevance of Metaverse technologies to HR functions. Participants agree that Metaverse-based onboarding could reduce the time and resources required for new hire orientation (mean=3.84 SD=0.874) and that a virtual onboarding program in the Metaverse would help new hires learn about the company faster (mean=3.80. SD=0.897).

Table 3. Descriptive Statistics of potential benefits and challenges implementing metaverse technologies in HR

Items	N	Mean	Std. Deviation	Trend
4. Employee privacy and data security are major concerns with using metaverse technologies	116	3.9	1.016	Agree
5. The cultural context in Saudi Arabia is supportive of adopting metaverse technologies	116	3.88	0.934	Agree
3. There are significant technical challenges to implementing metaverse technologies in HR	116	3.77	0.898	Agree
1.Implementing metaverse technologies in HR would improve employee productivity	116	3.74	0.759	Agree
2. Using VR/AR for training would reduce training costs and increase employee satisfaction and retention	116	3.62	0.901	Agree
General trend	**116**	**3.78**	**0.676**	**Agree**

Table 3 shows the descriptive statistics of potential benefits and challenges of implementing Metaverse technologies in HR. The general trend indicates agreement (mean=3.78, SD=0.676) among the participants

regarding the potential benefits and challenges. Participants agree that employee privacy and data security are major concerns (mean=3.9 SD=1.016) and that the cultural context in Saudi Arabia is supportive of adopting Metaverse technologies (mean=3.88, SD=0.934).

4.2 Reliability and Validity Analysis

To ensure the reliability of the measurement scale, Cronbach's Alpha was calculated for different constructs. The HR functions and metaverse adoption construct reported a reliability coefficient of 0.836, while the potential benefits and challenges construct achieved 0.802, indicating strong internal consistency. Factor analysis showed

Axis	Item	Loding	Cronbach
HR functions and its relation to Metaverse	A1	0.452	.836
	A2	0.777	
	A3	0.585	
	A4	0.507	
	A5	0.612	
	A6	0.644	
	A7	0.641	
	A8	0.519	
	A9	0.708	
the potential benefits and challenges of implementing metaverse technologies in HR	B1	0.593	.802
	B2	0.646	
	B3	0.554	
	B4	0.420	
	B5	**0.620**	

acceptable factor loadings, supporting construct validity

Table 4: The factor loadings and Cronbach's alpha values obtained from the factor analysis.

4.3 Hypothesis Testing

H0: There is no correlation between employees' awareness of the metaverse and their perceived effectiveness of metaverse technologies for recruitment and onboarding at Saudi telecommunications companies.

A Pearson correlation analysis revealed a significant positive correlation ($r=0.458$, $p <0.01$, $n=[116]$) between employees' awareness of the metaverse and their perception of its effectiveness for recruitment and onboarding.

Decision:

Since the p-value ($p<0.01$) is less than the significance level (typically 0.05), we reject the null hypothesis (HO). Therefore, we conclude that there is a statistically significant positive correlation between employees' awareness of the metaverse and their perceived effectiveness of metaverse technologies for recruitment and onboarding.

Table 5. Output of correlation between employees' awareness of the metaverse and their perceived effectiveness of metaverse technologies for recruitment and onboarding at Saudi telecommunications companies.

Variable	Average	Standard deviation	Correlation Coefficient	Decision
employees' awareness of the metaverse	3.04	0.838	.458**	Correlation is significant at the 0.01 level (2-tailed).
perceived effectiveness of metaverse technologies for recruitment and onboarding	**3.71**	**0.734**		

H0: Employees' perceived effectiveness of VR training simulations is not associated with their level of agreement towards implementing metaverse technologies for training and development.

The results showed a strong positive correlation ($r=0.634$, $p<0.01$, $n=[116]$), indicating that employees who found VR training effective were more likely to support its implementation in HR.

Decision:

Since the p-value ($p<0.01$) is less than the significance level (typically 0.05), we reject the null hypothesis (HO). Therefore, we conclude that employees' perceived effectiveness of VR training simulations is positively associated with their level of agreement towards implementing metaverse technologies for training and development.

Table 6. Correlation analysis for H2

Variable	Average	Standard deviation	Correlation Coefficient	Decision
Employees' perceived effectiveness of VR training simulations	3.63	0.840	.634**	Correlation is significant at the 0.01 level (2-tailed).
Implementing metaverse technologies in HR would improve employee productivity	**3.74**	**0.759**		

H0: There is no correlation between employees' concerns about privacy and data security in the metaverse and their level of agreement towards implementing metaverse technologies for performance management.

The correlation analysis indicated a significant negative correlation ($r=-0.411$, $p< 0.01$, $n=[116]$), demonstrating that higher concerns about privacy and security were associated with lower agreement towards adopting metaverse technologies for performance management.

Decision:

Since the p-value ($p<0.01$) is less than the significance level (typically 0.05), we reject the null hypothesis (HO). Therefore, we conclude that there is a statistically significant negative correlation between employees' concerns about privacy and data security in the metaverse and their level of agreement towards implementing metaverse technologies for performance management.

Table 7: Correlation Analysis for H3

Variable	Average	Standard deviation	Correlation Coefficient	Decision
employees' concerns about privacy and data security in the metaverse	3.83	0.821	.411**	Correlation is significant at the 0.01 level (2-tailed).
Implementing metaverse technologies in HR would improve employee productivity	**3.74**	**0.759**		

H0: Employees' age and years of experience at Telecommunications Companies are not associated with their overall thoughts and expectations regarding the use of metaverse technologies in HR practices.

ANOVA (Analysis of Variance) was used to compare the means of different age groups and experience groups. ANOVA is appropriate when you want to determine if there are statistically significant differences between the means of two or more independent groups. In this case, we wanted to see if the average perceptions of metaverse technologies in HR differed across age and experience categories.

Results:

ANOVA results indicated significant differences in perceptions based on age ($p<0.05$, n=[116]) Specifically, younger employees (<25 years) had a higher mean score (4.25) compared to older groups. However, years of experience did not show significant differences ($p>0.05$).

Decision:

Age: Since the p-value for age ($p<0.05$) is less than the significance level (typically 0.05), we reject the null hypothesis (HO) for the age variable. We conclude that there are statistically significant differences in perceptions of metaverse technologies in HR based on age.

Years of Experience: Since the p-value for years of experience ($p>0.05$) is greater than the significance level (typically 0.05), we fail to reject the null hypothesis (HO) for the years of experience variable. We conclude that there are no statistically significant differences in perceptions of metaverse technologies in HR based on years of experience.

Therefore, H4 is partially supported. Employees' age is associated with their overall thoughts and expectations regarding the use of metaverse technologies in HR practices, while years of experience are not.

Table 8: ANOVA Results for Age Differences in Metaverse Perceptions

Variable	Average	Standard deviation	Correlation Coefficient	Decision
Less than 25	4.25	0.593	.027	Significant differences at the 0.05
25 – 30	3.63	0.700		
31 – 35	3.65	0.600		
36 – 40	3.84	0.390		
40 +	3	.		
Total	**3.70**	**0.679**		

Table 9: ANOVA Results for Work Experience Differences

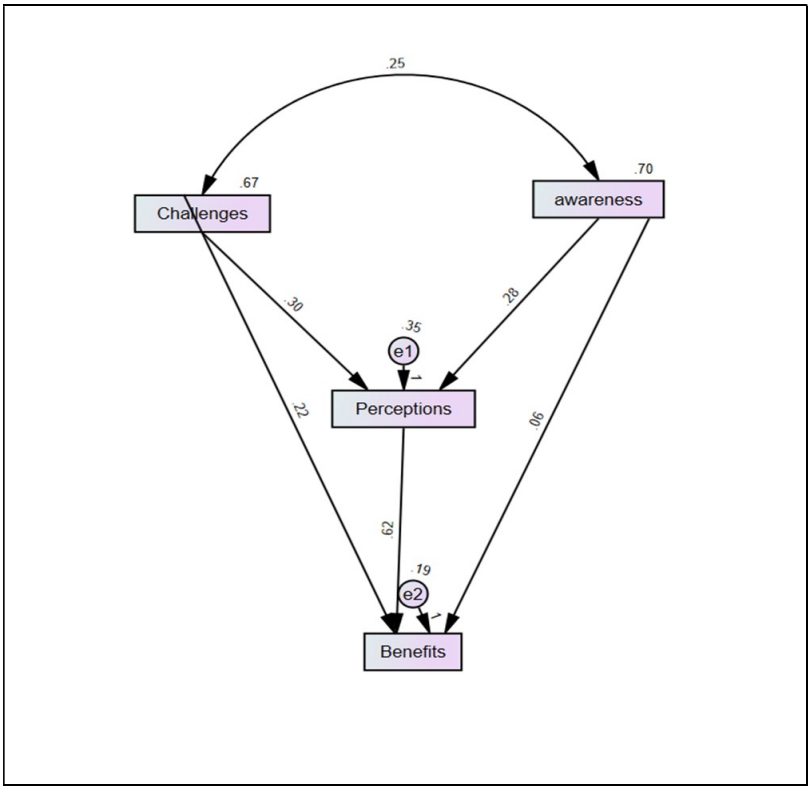
Variable	Average	Standard deviation	Correlation Coefficient	Decision
0 – 2	59	3.70	.730	Not significant differences at the 0.05
3 – 5	32	3.71		
6 – 10	20	3.58		
10 +	4	3.97		
Total	**3.69**	**0.671**		

4.4 Path Analysis (AMOS)

AMOS is used to assess the structural relationships between key variables. The path analysis model examines the relationships between "Challenges," "Awareness," "Perceptions," and "Benefits." Specifically, it models:

1. The direct effects of "Challenges" and "Awareness" on "Perceptions."
2. The direct effects of "Challenges," "Awareness," and "Perceptions" on "Benefits."
3. The covariance between "Challenges" and "Awareness".

Figure 3: AMOS Path Analysis Model



- The model has 0 degrees of freedom. This is because the number of distinct sample moments (10) equals the number of distinct parameters to be estimated (10).
- A model with zero degrees of freedom is a saturated model. This means the model perfectly reproduces the observed data.

The detailed model fit information is as follows:

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Perceptions	<---	Challenges	.302	.073	4.156	***	
Perceptions	<---	Awareness	.281	.071	3.955	***	
Benefits	<---	Perceptions	.617	.069	8.910	***	
Benefits	<---	Challenges	.219	.058	3.782	***	
Benefits	<---	Awareness	.063	.056	1.113	.266	

- **Challenges → Perceptions:** Challenges have a significant positive effect on perceptions (β = 0.302, p < 0.001).
- **Awareness → Perceptions:** Awareness has a significant positive effect on perceptions (β = 0.281, p < 0.001).
- **Perceptions → Benefits:** Perceptions have a significant positive effect on benefits (β = 0.617, p < 0.001).
- **Challenges → Benefits:** Challenges have a significant positive effect on benefits (β = 0.219, p < 0.001).
- **Awareness → Benefits:** Awareness does not have a significant effect on benefits (β = 0.063, p = 0.266)

- Perceptions **are the strongest predictor of benefits (β = 0.617, p < 0.001).** Employees' views and attitudes shape their ability to experience benefits positively.
- Challenges **affect both perceptions (β = 0.302) and benefits (β = 0.219).** This suggests that challenges can drive employees to view their work differently, and this, in turn, impacts their perceived benefits.
- Awareness **alone does not directly improve benefits (p = 0.266),** but it does improve perceptions (β = 0.281). This indicates that awareness must influence perceptions before it can enhance benefits.

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Challenges	<-->	Awareness	.251	.068	3.706	***	

- Challenges <--> Awareness: Challenges and awareness are significantly positively correlated (r = 0.251, p < 0.001) meaning that individuals facing more challenges may also have higher awareness levels
- This suggests that real-world exposure to challenges increases an individual's awareness of workplace policies, benefits, or procedures.

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
Challenges	.668	.088	7.583	***	
Awareness	.696	.092	7.583	***	
e1	.350	.046	7.583	***	
e2	.193	.025	7.583	***	

- All variances are statistically significant.
- Challenges and Awareness have high variance, indicating that employees experience different levels of these factors.
- The variance in Perceptions suggests additional factors might influence it beyond Challenges and Awareness.

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	10	.000	0		
Saturated model	10	.000	0		
Independence model	4	174.266	6	.000	29.044

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.000	1.000		
Saturated model	.000	1.000		
Independence model	.233	.549	.249	.330

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	1.000		1.000		1.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.000	.000	.000
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	.000	.000	.000
Saturated model	.000	.000	.000
Independence model	168.266	128.863	215.094

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.000	.000	.000	.000
Saturated model	.000	.000	.000	.000
Independence model	1.515	1.463	1.121	1.870

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Independence model	.494	.432	.558	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	20.000	20.909	47.536	57.536
Saturated model	20.000	20.909	47.536	57.536
Independence model	182.266	182.630	193.280	197.280

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	.174	.174	.174	.182
Saturated model	.174	.174	.174	.182
Independence model	1.585	1.242	1.992	1.588

HOELTER

Model	HOELTER .05	HOELTER .01
Default model		
Independence model	9	12

Model Fit explanation

The model fit for the default model reveals a perfect fit to the data, a characteristic indicated by several key statistics. The Chi-square statistic is 0.000 with 0 degrees of freedom, a result that prevents the computation of a probability level. This Chi-square value, in conjunction with zero degrees of freedom, signifies that the model perfectly reproduces the sample data, which is further supported by a Goodness-of-Fit Index (GFI) of 1.000 and a Root Mean Square Residual (RMR) of 0.000. Comparative fit indices, including the Normed Fit Index (NFI), Relative Fit Index (RFI), Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI), all register at 1.000, reinforcing the conclusion of a perfect fit relative to the baseline model. Notably, the Root Mean Square Error of Approximation (RMSEA), a measure typically used to assess how well a model fits the population data, is not applicable or computable for the default model due to the absence of degrees of freedom; however, it is reported as .494 for the independence model.

In conclusion, the Amos path analysis model demonstrates a perfect fit to the observed data, as evidenced by the zero degrees of freedom, Chi-square of 0.000, and ideal fit indices (GFI = 1.000, RMR = 0.000, CFI = 1.000, etc.). The model indicates significant positive relationships between "Challenges" and "Awareness" on "Perceptions," and between "Perceptions" and "Challenges" on "Benefits." Furthermore, "Challenges" and "Awareness" show a significant positive covariance. However, the direct effect of "Awareness" on "Benefits" was not significant.While the model perfectly reproduces the data, it's essential to acknowledge its saturated nature. By definition, saturated models lack degrees of freedom, which means they do not test the proposed relationships or hypotheses. Instead, they simply perfectly describe the data, limiting the ability to generalize these findings beyond this specific dataset. Essentially, this model prioritizes perfect fit over parsimony and does not provide insight into how these relationships might hold true in other samples or under different

5. Discussion

The discussion section interprets the results, relates them to the existing literature, and discusses their implications.

5.1 Interpretation of Findings

The results of this study provide valuable insights into the potential applications and implications of metaverse technologies for HR practices at Saudi telecommunications companies. The descriptive statistics illustrate the

demographic composition of the participants, with a higher representation of females and a majority of participants aged between 25 and 30 years. The prevalence of employees with 0-2 years of experience suggests a relatively young workforce, which may be more adaptable to new technologies. The reliability analysis confirms the internal consistency of the measurement scales, indicating that the questionnaire effectively measures the intended constructs. The significant positive correlations found for H1 and H2 suggest that employees' awareness of the metaverse and their perceived effectiveness of VR training simulations are strongly associated with their support for metaverse adoption in HR functions such as recruitment, onboarding, training, and development. These findings align with the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use are key drivers of technology adoption.

The significant negative correlation for H3 highlights the importance of privacy and data security concerns in the context of metaverse technologies. Employees' apprehensions about these issues are negatively related to their agreement towards implementing metaverse technologies for performance management. This underscores the need for organizations to address privacy and security concerns to gain employee trust and acceptance of metaverse-based HR applications. The ANOVA results partially support H4, indicating that age is a significant factor influencing employees' thoughts and expectations regarding metaverse adoption, while years of experience is not. Younger employees tend to be more receptive to metaverse technologies, which could be attributed to their greater familiarity and comfort with digital innovations. This finding has implications for targeted training and change management strategies to ensure effective adoption across different age groups.

The path analysis results further elucidate the structural relationships between key variables. It explored the relationships between challenges, awareness, perceptions, and benefits, revealing several key findings. The path analysis results further elucidate the structural relationships between key variables. It explored the relationships between challenges, awareness, perceptions, and benefits, revealing several key findings. The results indicated significant positive effects of challenges (Estimate = .302, $p < .001$) and awareness (Estimate = .281, $p < .001$) on perceptions, and of perceptions (Estimate = .617, $p < .001$) and challenges (Estimate = .219, $p < .001$) on benefits, while also highlighting a significant positive covariance between challenges and awareness (Estimate = .251, $p < .001$).

However, awareness did not significantly predict benefits (Estimate =.063, p=.266). The model demonstrated a perfect fit to the data, evidenced by a Chi-square of 0.000 with 0 degrees of freedom, a Goodness-of-Fit Index (GFI) of 1.000, and a Root Mean Square Residual (RMR) of 0.000, with comparative fit indices such as the Normed Fit Index (NFI), Relative Fit Index (RFI), Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI) all registering at 1.000. This perfect fit suggests that the model accurately reproduces the observed relationships within this dataset; however, it is crucial to acknowledge that this is characteristic of a saturated model, limiting the generalizability of these findings. The significant positive effects suggest that higher perceived challenges and greater awareness are associated with stronger perceptions, and that more positive perceptions and higher challenges predict greater perceived benefits, potentially indicating that even amidst challenges, individuals can still recognize benefits. The non-significant effect of awareness on benefits might be explained by the effect being fully mediated by perceptions or the influence of other unmeasured variables.

In terms of limitations, the use of a saturated model restricts the ability to generalize these results, and future research should aim to replicate these findings with a model possessing degrees of freedom and a larger sample size to enhance generalizability and explore additional variables that may influence these relationships. Ultimately, this model provides a detailed description of the relationships between the variables within this specific dataset, forming a basis for future research.

5.2 Relationship to Prior Research

The findings of this study are consistent with previous research on the potential of metaverse technologies in HR. The positive impact of VR/AR/XR technologies on training and development aligns with the findings of Weyrauch and Herczeg (2021), which highlight improved training efficiency and increased knowledge retention. The effectiveness of VR job previews in enhancing candidate attraction and fit with the role is supported by studies such as De Lange et al. (2020). The importance of social interaction in VR training, as evidenced by greater learning outcomes in shared virtual environments, is consistent with the research of Bailenson et al. (2008).

The study also contributes to the growing body of literature on the metaverse and the future of work in the Middle East, as highlighted by HRME (2023). By focusing on telecommunications companies in Saudi Arabia, this research provides valuable insights into the specific context of metaverse adoption in the Kingdom, complementing broader studies on metaverse development in Saudi Arabia, such as Al Ghamdi (2023).

5.3 Implications of the Study

The findings of this study have several important implications for Saudi Telecommunications Companies considering the implementation of metaverse technologies in HR.

- **Enhance Employee Awareness:** Organizations should invest in educational initiatives to increase employee awareness and understanding of the metaverse and its potential applications in HR. This can help foster positive perceptions and facilitate adoption.
- **Prioritize VR Training:** The strong positive association between perceived effectiveness of VR training simulations and support for metaverse adoption suggests that VR training is a promising area for implementation. Organizations can leverage VR to create engaging and effective training programs that enhance employee skills and knowledge retention.
- **Address Privacy and Security Concerns:** Organizations must prioritize addressing employee concerns about privacy and data security to gain trust and acceptance of metaverse-based HR applications. This includes implementing robust security measures, ensuring data privacy compliance, and communicating transparently about data usage practices.
- **Tailor Adoption Strategies to Age Groups:** The finding that younger employees are more receptive to metaverse adoption highlights the need for tailored adoption strategies for different age groups. Organizations can leverage the enthusiasm of younger employees while providing targeted training and support to older employees to ensure effective adoption across the workforce.
- **Focus on Perceived Usefulness and Ease of Use:** In line with the Technology Acceptance Model (TAM), organizations should focus on demonstrating the perceived usefulness and ease of use of metaverse technologies to drive adoption. This can be achieved through user-friendly interfaces, clear instructions, and highlighting the benefits of metaverse applications in HR.

5.4 Limitations

This study has several limitations:

1. **Sample Size:** The relatively small sample size of Saudi Telecommunications Companies may limit the generalizability of the findings to the broader population. A larger, more diverse sample could provide insights that are more representative.
2. **Single Organization Focus:** The study's focus on Telecommunications Companies limits the generalizability of the findings of other industries. Further studies could explore the adoption of metaverse technologies in different organizational contexts to gain a broader understanding of the challenges and opportunities.
3. **Cross-Sectional Design:** The cross-sectional nature of the study prevents establishing causal relationships between variables. Future longitudinal studies could track changes in employee attitudes toward metaverse technologies over time, providing more robust insights.

5.5 Future Research

Future research could build upon the findings of this study by addressing the limitations mentioned above. Key areas for future investigation include:

1. **Longitudinal Studies:** To explore how perceptions and attitudes toward metaverse technologies evolve over time, longitudinal research would be valuable. This type of study could help understand how long-term exposure to these technologies impacts employee adoption and effectiveness.
2. **Qualitative Research:** Qualitative research methods, such as in-depth interviews or focus groups, could provide a deeper understanding of employee experiences and perceptions regarding metaverse applications in HR. These insights could complement the quantitative findings from this study.
3. **Broader Context:** Future studies could examine the metaverse adoption process across different industries or geographic regions. This would provide a more global view of how organizations are incorporating metaverse technologies into their HR practices.
4. **Investigating Organizational Culture:** Research could explore how organizational culture and leadership influence the adoption of new technologies, such as the metaverse, and how change management strategies can mitigate resistance to such innovations.

6. Conclusion

This study offers important insights into the potential applications of metaverse technologies in HR, particularly at Saudi Telecommunication companies. The findings highlight the importance of awareness, the effectiveness of VR training, the impact of privacy concerns, and the role of age in adoption processes. These insights provide a roadmap for organizations looking to implement metaverse-based HR solutions, emphasizing the need for targeted education, privacy safeguards, and generational considerations. The study contributes to the growing body of literature on metaverse adoption in HR, especially within the Middle Eastern context, and paves the way for further research on this emerging field.

References

AlGhamdi, S. (2023). Metaverse Development in Saudi Arabia. Strategic Gears. Retrieved from https://engine.strategicgears.com/files/metaverse development in saudi arabia_en.pdf

Al-Shuaibi, B., & Olfman, L. (2022). The impact of COVID-19 on remote work in Saudi Arabia: Challenges and opportunities. Journal of Global Information Technology Management, 25(3), 189-211.

Bailenson, J. N., Yee, N., Blascovich, J., & Beall, A. C. (2008). The use of immersive virtual reality in the learning sciences: Digital transformations of teachers, students, and social context. The Journal of the Learning Sciences, 17(1), 102-141.

Bhaker, P., & Sharma, R. (2023). A Review on Metaverse and Human Resource Management. International Journal of Advance Research and Innovative Ideas in Education. 3(1), 1651-1658. https://www.researchgate.net/publication/378941000_A_Review_on_Metaverse_and_Human_Resource_Managemen

Brynjolfsson, E., Horton, J., Ozimek, A., Rock, D., Sharma, G., & TuYe, C. H. (2020). COVID-19 and remote work: An early look at US data. National Bureau of Economic Research Working Paper Series, (w27344).

De Lange, A. H., Vuuren, L. van, & De Witte, H. (2020). Virtual reality job previews: Effects on applicant attraction and job pursuit intentions. International Journal of Selection and Assessment, 28(2), 159-174.

Dionisio, J. D. N., Burns, W. G., & Gilbert, R. (2013). 3D virtual worlds and the metaverse: Current status and future possibilities. ACM Computing Surveys (CSUR), 45(3), 1-38..

Hall, L., Smith, J., & Jones, D. (2024). The impact of virtual reality social events on employee morale in remote teams.

HRME. (2023). Working in the metaverse: What the future of work in the Middle East would look like. Economic Times. Retrieved from https://hrme.economictimes.indiatimes.com/news/industry/working-in-the-metaverse-what-future-of-work-in-the-middle-east-would-look-like/93593530

Huang, T. L., Chen, C. W., & Lin, X. Y. (2022). Augmented reality in onboarding: A study of employee experience and organizational effectiveness. Journal of Business Research, 149, 1128-1139.

Lee, L. H. (2022). Metaverse as the future of work: A review and research agenda. Journal of Business Research, 151, 112982.

Meyer, A., Kim, K. J., & Leite, F. (2019). Impact of virtual reality training on hazard recognition and safety behavior: An experimental study. Construction Management and Economics, 37(10), 545-559.
Mystakidis, S. (2022). Metaverse. Encyclopedia, 2(1), 486-497.
Pan, Y., Zhang, J., & Wang, X. (2021). Virtual reality for performance assessment: A comparative study with traditional methods. Journal of Educational Computing Research, 59(1), 114-133.
Pellas, N., & Kazanidis, I. (2023). Metaverse and Human Resources Management: A Conceptual Framework. Foresight, 25(1), 70-83.
Porter, M. E., & Heppelmann, J. E. (2017). Why every organization needs an augmented reality strategy. Harvard Business Review, 95(6), 46-57.
PwC. (2019). Seeing is believing: How virtual reality and augmented reality are transforming business and the economy.
Riva, G., Wiederhold, B. K., & Mantovani, F. (2019). Neuroscience and virtual reality: from virtual exposure to embodied interaction. Cyberpsychology, Behavior, and Social Networking, 22(1), 82-96.
Roulin, N., & Levashina, J. (2019). Realistic job previews: A meta-analysis and directions for future research. Journal of Applied Psychology, 104(11), 1387-1408.
Salas, E., Tannenbaum, S. I., Kraiger, K., & Smith-Jentsch, K. A. (2012). The science of training and development in organizations: What matters in practice. Psychological Science in the Public Interest, 13(2), 74-101.
Smith, C. (2021, March 23). Case study: Walmart embraces immersive learning. Chief Learning Officer. https://www.chieflearningofficer.com/2021/03/23/case-study-walmart-embraces-immersive-learning/
Webel, S., Bockholt, U., Engelke, T., & Gavish, N. (2013). An augmented reality training platform for assembly and maintenance skills. Robotics and Autonomous Systems, 61(4), 398-403.
Weyrauch, T., & Herczeg, M. (2021). Augmented and virtual reality in the workplace: Applications, benefits and challenges. International Journal of Human-Computer Interaction, 37(10), 872-887.
XR Today. (2023). The Future of Work and the Metaverse. XR Today. Retrieved from https://www.xrtoday.com/mixed-reality/what-is-the-future-of-work-and-the-metaverse/