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The Influence of Applying Metaverse on Enhancing the Education Quality in KSA

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Abstract: The objective of this research study was to illuminate the pivotal role of metaverse technology in boosting the standard of education in the Kingdom of Saudi Arabia. For the purpose of answering the research objectives of the study and determining its objectives, the study adopted a mixed-method approach, a combination of quantitative and qualitative studies. It used qualitative semi-structured interviews with 10 directors and officials at the Information Technology department for the Ministry of Education in Jeddah, Saudi Arabia, in addition to a number of school principals. Furthermore, from the qualitative side, 126 staff from the Ministry of Education in Jeddah were in the sample as well. Following the collection of qualitative and quantitative data, it was investigated using the sequential explanatory approach resulting at conclusion with multiple results. According the keyword facts, Saudi Arabia is very well placed to integrate metaverse applications in schools in a way that will result in high quality learning for the students. Though the system must be improved as far as digital infrastructure is concerned, if the foundations essential for achieving high education quality are missing, right now we cannot expect the metaverse to be the answer to the persistent problems of the educational system in the country. It is also worth noting that hitting metaverse technologies in the Saudi education domain will open a new era for high-quality education and may cause the educational process to transform to a new far stretched stage. With these findings in mind, we will formulate a few strategic reasons for the future. Another focal point would be the Saudi Ministry of Education which should start building both physical structures and necessary tools for providing high-grade technological and technical education at public schools and pushing independently owned schools toward the same goal. In addition, it's recommended for Saudi Arabia and stakeholders in tertiary education utilize country's outstanding technologies to lead the digital teaching infrastructure.

Keywords: Metaverse, Virtual Reality, Augmented Reality, Education, Jeddah, Kingdom of Saudi Arabia.

1. Introduction

The technological advancement of recent times has changed the game even beyond expectation. This sort of change, however, goes beyond our imagination with the discovery of the metaverse, a concept that is already seering to transform human connection and communication on a grand scale [1]. Governments and countries are getting in the race and trying to stay up to date with these innovations realizing the need to be competitive on the world economic front. For one, Saudi Arabia, aligning with the broader notion of finding prosperity and growth, appreciates the

critical value of using metaverse differently as the most in one sector; education. Education ranks among the most important indicators of a country's progress and is the best way to develop it. Due to these factors, the value of e-learning and technology-supported education are becoming seen as more advanced educational methods in the present age. These types of learning is driven by using every kind of communication and technology tools and channel to content this information and skills [3]. Such platforms of learner-teacher and learner-peer involvement allow for active interaction of students and educational content, as well as communication abilities of both synchronous and asynchronous collaborations. This is on the student's own schedules, according to capacities and learning pace, with all educational activities, under a strict system of a specialized system [4]. In view of the given effect, the research in the current study aims to find out the impact of applying metaverse technologies in the context of school education. It is particularly intended to expose the impact it may have on the quality of education in the Country of Saudi Arabia compared to the international indicators. The during the course of the research, the concepts are as well applied to the scientific cases and collective feedbacks from the preselected entities are also assessed.

2. Theoretical Framework and Previous Studies

The word "metaverse" originated from the cognizable world as being the abbreviation for "meta-universe". It means a universe that consists of an infinite number of another existing universe. The novel was set in 2045 when a tech company called "the button" allowed users to own their own virtual world. But instead of being owned by corporations, the virtual world was owned by individual businesses. The term "metaverse" comprises two parts: "Me-ta," that corresponds to both "beyond" and "after," and "Verse" (universalize), which tosses a glance at the world.

The contemporary thinking of educational quality, which hand in hand with its constituent elements, requirements and standards, is the notion that contains the content of modern ideas related to the methods of teaching in education. These ways of life are seen as the upgrades and honors of societies, leading to their scientific, cultural and social development. It was this concept that have contributed to the development and spread of reforms in education and human capacity building systems, which is the top concern of most government officials working in both developing and advanced countries. This is as a result of their firm conviction that human capital development serves as a foundation of every renaissance including economic, social and cultural. These long-term impact strategies offer lasting solutions concerning the sustainable development of any location relative to the rest of the world, included here [5]. In fact, the contemporary **change management** [1]set of issues such as competence development, capacities of talents are broadly discussed in management at organizational level [6]. It automatically reiterates why an enterprise has to encourage a human capital development program and put up with the rigors that come with transformation in the business environment that shows no signs of slowing down. Development of human capacity as a main factor and the constant improvement of organizational skills is highly significant for producing excellent results and for the sustainable responses to resolving different challenges. Therefore, it can be interpreted as a complex system of procedures intended to strengthen the capacities and skills of an individual and, in this way, produce the best in him or her. Develop human resources, run training and seminars, boost the work environment and energize the team using technology tools [7].

Al-Matoua [8] understands capacity building as an administrative process which is accompanied by the external intervention of others for the optimization and development of organizational objectives. This process analyzes the multiple factors that are involved such as cultural, social, economic, and political contexts and it does it using its own readily available resources.

[1] **Change Management:** this is a field of administrative science encompassing a range of strategic activities, which include a repository of theories, intellectual frameworks, techniques, and interventions that follow modern behavioral sciences. This management aims to implement its strategies and plans for change towards improvement, and it is responsible for the outcomes and consequences of this change.

Knowledge management[2] [9] is one of the optimal instruments by which the firms can improve their performance and employees' performance. Building the institution's capability moreover will permit it to respond to discrepancies, trends, findings, and discoveries. The current situation indicates that we are faced with a revolution of knowledge and virtual environments, and as such, has shaped the systems today. It is widely known that a number of enterprises do not attain their actual potential due to issues of information such dissemination of knowledge, retention and modifications. In that respect, skills in electronic e-learning, robotics, artificial intelligence, science play vital roles for students in any educational institution and school. They have to comprehend that they are modifying their previous norm. In other words, information processing and the ability to become a change-maker are intertwined [10].

The study conducted by Al-Faqi [11] focused on the e-learning model of distance education, which is more relevant today due to the implications of COVID-19 pandemic on the educational sector. Moreover, Al-Harbi´s [12] study underscores the integration of virtual reality in English language labs, which contributes to the improvement in writing competence for Saudi high school students. It implies that the level of the proliferation of virtual reality in this particular sector at present is very fine. The results signify the efficacy and distinction of e-learning technologies and virtual reality both in mature and emerging fields of education. Such technologies are increasingly found to be more relevant, especially now that we are in the face of a pandemic that threatens many fields regarding our educational set-up, where new and unique methods are required.

3. Study Design

The study utilized a mixed-methods approach, combining quantitative and qualitative techniques. This approach is commonly used in scientific research to access vast amounts of data and information. The research employed a sequential explanatory design, focusing on quantitative data analysis first and then qualitative data analysis. This strategy allows for a reasonable ground to verify the findings of the quantitative study and make sense of them [13].

This study gathered data from 1,300 directors and teachers in the Jeddah region from 2021, using a "stratified random sampling" method. The data was gathered from the Ministry of Education's employees and administrative staff of schools in Jeddah. The qualitative study involved 2,694 full-time and established employees and executives in the Jeddah governorate, with the latest data dated 1/11/2022. The research was supported by the Ministry's resources. The study surveyed 70 school directors and staff, with a high ratio of 130, to represent 10% of the original respondents. A questionnaire was sent to 110 individuals, with 108 completed and ready for analysis. Purposive sampling was used as the qualitative method. The survey used a mixed method strategy, with questionnaires and interviews as baseline data sources. SPSS statistical software was used for analysis, while transcripts were interpreted from interviews. The researcher relied on exploratory studies and publications as secondary sources for data and information. The study implemented a primary hypothesis and introduced several sub-hypotheses.

The majority of the articles with great databases whose data can be freely accessed by putting them in the public database should give the correct details of the place of deposition and the accession numbers. If the accession numbers have not yet obtained at the moment of submission, you can please inform the readers that they would be provided during the reviewing process. They are necessarily uncovered before printing. All intervention studies that have involved humans or animals, and any other study requiring ethical approval, need to list the authority that granted approval and indicate the ethical approval code.

4. Study Hypotheses

[2] **Knowledge management** is a set of processes aimed at accomplishing tasks through well-planned, sequential steps to achieve long-term competitiveness. Its purpose is to enhance awareness of organizational culture and the ability to acquire and share collective expertise, thereby fulfilling the organization's objectives and mission.

Main Hypothesis; The implementation of metaverse technology in the education sector positively influences the improvement of educational quality in the Kingdom of Saudi Arabia. This main hypothesis gives rise to several sub-hypotheses, as follows: The implementation of metaverse technology in the education sector positively influences the improvement of educational quality in the Kingdom of Saudi Arabia. This main hypothesis gives rise to several sub-hypotheses, as follows:

Sub-hypothesis 1: The Saudi government, including the Kingdom of Saudi Arabia, boasts all the conditions required for the productive application of virtual reality technologies in education.

Sub-hypothesis 2: Saudi Arabia's educational sector will have an infrastructure that will support the use of the metaverse in various aspects.

Sub-hypothesis 3: The Kingdom of Saudi Arabia has this total structure consisting of schools, teachers, programs, and scientific and individual data that is aimed at the adaptation of virtual worlds, and this process will help to enhance the quality of education at the Kingdom.

5. Results and Discussion

The subheadings used in this section, concisely and precisely describe the experimental findings, their interpretation, and the experimental conclusions.

5.1. Analyzing Demographic Data

5.1.1. Academic Qualification

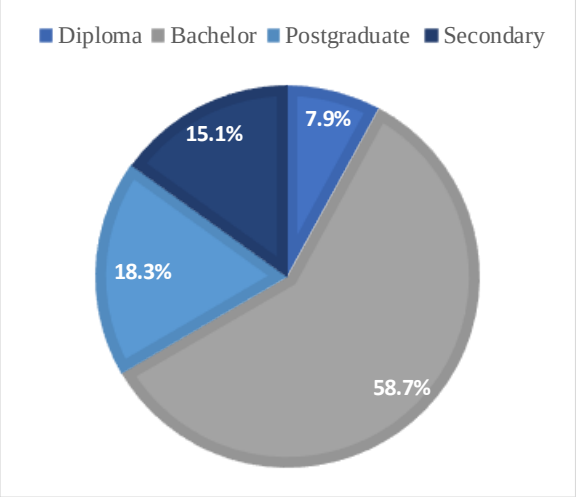

Figure 1. Academic Qualification-Based Participant Distribution. Source: Researcher's Construction.

As we can see from the following data, nearly 74 (58.7%) of the study participants have the university education. Next, the graduate category comes down for which 23 individuals, encompassing 18.3% of the sample population, have been surveyed. Lastly, the group of people who have mastered high school level education stands on high school level education includes 19 individuals who account for 15.1% of the sample. The distribution of results implies the fitting and well-educated academic background of the students who took part in the research, which once again proves their ability to comprehend and understand the requirements of the questionnaire. It is about making a maximum selection of the sample which completely possesses all the traits and features of the original population. It comprises numerous sampling procedures whereby they meet diverse samples of participants.

5.1.2. Age

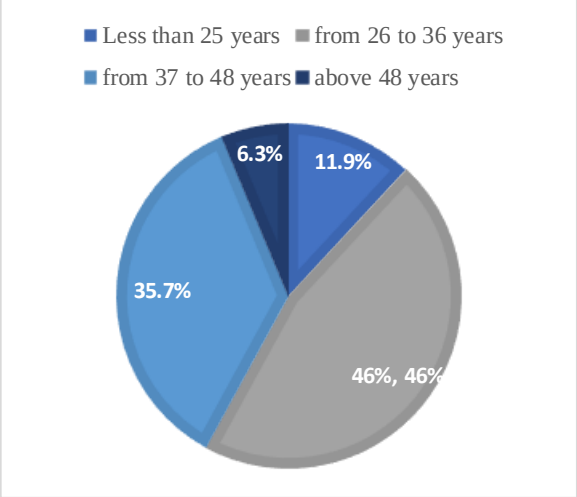

Figure 2. Distribution of the Participants According to the Academic Qualification. Source: Researcher's Construction.

Based on the preceding data it is evident that the study sample is composed mostly of age category of 26 - 36 years with 58 individuals which is approximately 46% of the sample population. Subsequently, the age group 37 - 48 years, which was made up of 45 individuals, comprising 35.7% of respondents was found. The third group to get in the row was the ones with an age lower than 25with a number of 15 ones made up the percentage of 11.9% from the sample. Last but not least, the age group (≥ 48 years) continued with 8 cases, which constituted 6.3 % of the entire crew. Since it can be inferred that the majority of the study group is comprised of the youth age group which aligns to the educational level of the subjects, this research can be a good sampling tool. Furthermore, this illustrates the correctness and convenience of the chosen sampling method to characterize the target population that also determines the level and degree of respondent's response output.

5.1.3. Academic Qualification

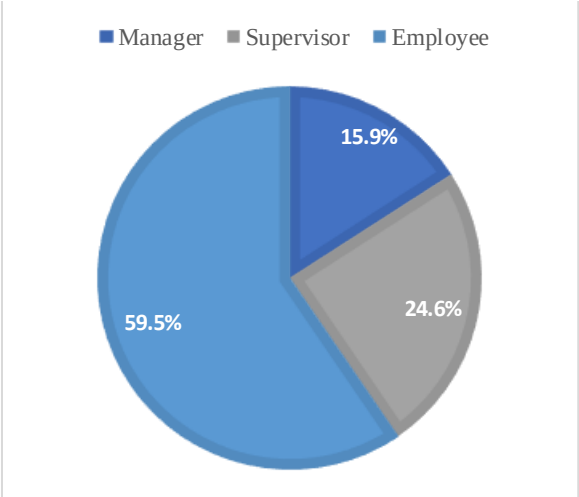

Figure 3. The Distribution of the Participants According to their Job Level. Source: Researcher's Construction.

The data presented have shown that the employees were the majority, with 86 individuals placed at (employee) level that is equal to 67% of the sample. The department of directors is ranked second, with 24 people at the directorship level represents as (consist of) 18% of the sample. Next, (supervisors) come down who include of 20 individuals, (the supervisors) category, and the count of them being (15%) of the total participants. In this distribution a general idea can be seen, which is the necessity of distributing the questionnaires among different social classes, ethnic groups, age

categories so as to gather a maximum number of opinions and responses with regard to the questionnaire subject. The fruit of this richness of culture is the productions that the people are proud of.

5.1.4. Years of Experience

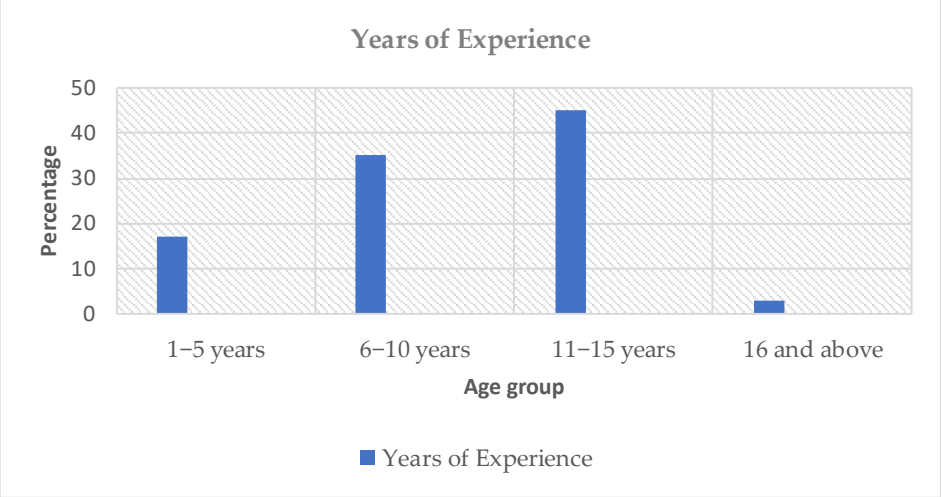

Figure 4. The Participants' Distribution based on Their Years of Experience. Source: Researcher's Construction.

The data indicates that the largest group in terms of years of experience is (11-15 years), composed of 59 individuals, which makes 45% of all people. This was followed by the category (6 to 10 years), with 45 persons, meaning 35% of the total. In third place was the category (1 to 5 years), comprised of 22 persons that totaled 17%. Lastly, there were four people in the other age category (16 years and more), which is equivalent to 3% of the total study sample. This proves that the study sample has not only a sufficient level of experience in the field of education in general, but also a distinct point of view on the subject of the study. The level of experience mostly depends on the education level, age, and occupation of the surveyed. Therefore, it can be concluded that the study sample matches the original study population.

5.2. Analyzing the Questionnaire's Items and Statements

In the other section of my research questionnaire was a series of items and statements tailor-made by the researcher to ascertain the proportion and effect of the metaverse adoption for the improvement of the learning outcomes of the school pupils from Saudi Arabia Kingdom. The questionnaire contained questions and statements developed from the instrument invented with five-points scale. The author is trying to convey the lack of uniqueness in the content of the questionnaire and the monotonous nature of the questions. The author used the adjective "penned" in a metaphorical way to compare the written questions to writing. Additionally, the author employed the description "from the instrument invented with five-points scale"

We managed to realize our priorities while collecting the data of questionnaires and surveys along with quantitative data and information processing. These were obtained through employees and man-agers of public schools affiliated with the Ministry of Education in Jeddah, Saudi Arabia, as follows: Besides the general characteristics of the job, I also obtained these through employers and administrators of public-school institutions affiliated with the Ministry of Education in Jeddah, Saudi Arabia, as:

Table 1. The Relative Significance of the Respondents' Responses

Explanation	The Value of Athematic Means
Very low/ strongly disagree	1.00 to 1.80
Low/ disagree	1.81 to 2.60
Neutral/ Medium	2.61 to 3.40

High/Agree	3.41 to 4.20
Very high/strongly agree	4.21 to 5.00

Table 2. The Arithmetic Means and Standard Deviations Related to the Impact of Metaverse Implementation on Improving the Quality of School Education.

No.	Statements	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree	Means	Standard Deviation	Relative Significance	Rank
1	Metaverse technologies positively influence the outcomes of school education in the Kingdom.	%34.6	%31	0	%11.4	%23	4.783	0.413	Very High	1
2	The Kingdom boasts a robust technological infrastructure for the adoption of the Metaverse in the school education sector.	%21.5	%49	%0.07	%11.4	%18.03	4.688	0.489	Very High	3
3	Educational institutions in the Kingdom are equipped with distinguished infrastructures that enable the implementation of the Metaverse.	%30	%36	%33.79	%0.06	%0.15	3.793	0.562	High	10
4	Schools in the Kingdom have qualified teachers to handle Metaverse technologies.	%20	% 44.5	%30.5	%4.87	%0.13	3.81	0.584	High	9
5	The traditional school curricula in the Kingdom can be easily transformed into digital formats.	%22.3	%42.3	%17.5	%11	%6.9	4.131	0.539	High	6
6	School students in the Kingdom are considered qualified to engage with the Metaverse in education.	%20.7	%37.7	%22.3	%15.3	%4	4.646	0.188	Very high	4
7	Integrating the Metaverse into the education sector improves the global education quality index.	%27.6	%49.2	%16.9	%11.5	%6.3	4.113	0.358	High	8
8	The Metaverse poses a risk to the privacy of school students in the Kingdom.	%16	%43.8	%26	%0.09	%14.11	4.146	0.557	high	5

9	Metaverse technologies facilitate optimal management of financial and human resources in the Kingdom.	%21.5	%26.9	%32.3	%13.8	%5.5	3.875	0.522	High	7
10	Metaverse technologies aim to enhance the efficiency of educational and administrative frameworks in the Kingdom.	%34.6	%43.8	%19.2	%2.4	0	4.763	0.488	Very high	2
The Scope and Impact of Metaverse Implementation in Enhancing Educational Quality.							**4.274**		High	

The study reveals that the application of metaverse technology in the Kingdom of Saudi Arabia has a positive effect on education quality, ranking first with an arithmetic mean of 4.783. The main reason for this is the efficiency of the educational and administrative system. The Kingdom's engineering and infrastructure for rapidly adopting metaverse in school education are also significant. The study concludes that the realization of metaverse in the classroom leads to an increase in learning quality.

The Hashemite Kingdom of Saudi Arabia has a strong and advanced technology infrastructure that supports the implementation of Metaverse in the school education sector. However, schools in the Kingdom have a deficit in this area, making it crucial to develop the infrastructure to drive positive metaverse technologies. The Education Sector superstructures, which include students eligible for Metaverse activities, have a high relative importance, but the schools have highly skilled educators proficient in managing Metaverse technologies. This suggests that the substructures comprising students are separate from Juggernaut and can efficiently handle Metaverse technologies. However, superstructures may become encumbered with the teacher element, making it necessary to enhance teachers' quality. Mitigating measures are considered reasonable to enhance teachers' levels of proficiency in managing Metaverse technologies.

5.3. Analyzing the Interview Findings and Data

5.3.1. First Segment: Analyzing Demographic Data

- Academic Level;

Graph (5) shows that in the studied group about 60% are university graduates and 40% are those with a post-graduate education. The case is without the individuals of diploma and high school rather. The given information corroborates the fact that qualitative survey' s sample members are well-educated, and therefore they know how to answer the questions we have prepared to identify the influence of digital Metaverse technologies on the overall quality of education.

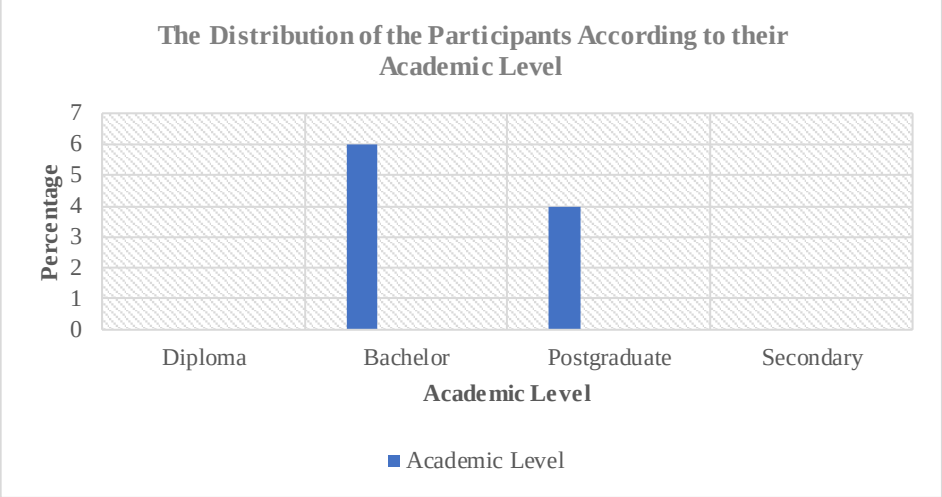

Figure (5): The Participants' Distribution Based on their Academic Level. Source: Researcher's Construction.

- Age Group;

Figure (6) denotes that the sample that was interviewed qualitatively can be split into 2 sections. The first section consists of the age group of 26 to 36 years and makes up for 50% of the population. The second section also has 50% of the population of the ages 37 to 48 years. With this finding, the evidence and the reasoning are concordant to the educational level variable's data.

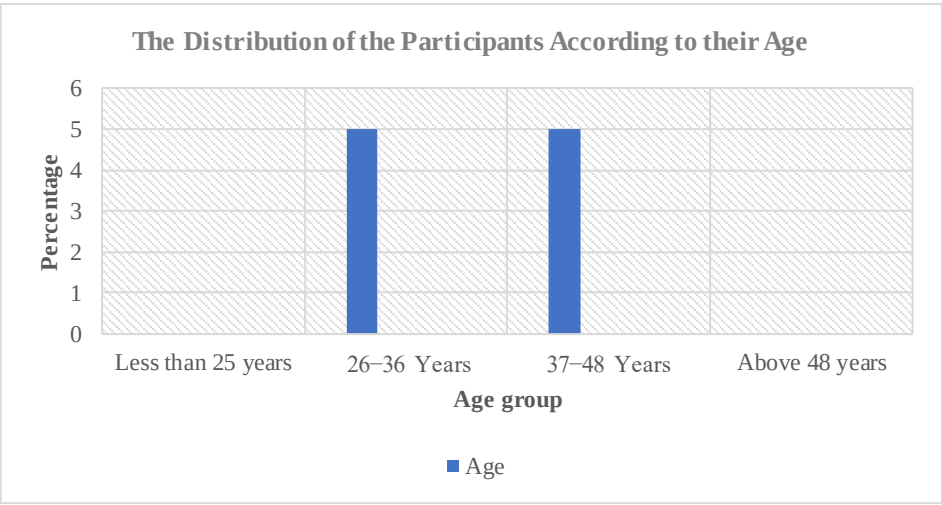

Figure: (6): The Participants' Distribution based on their Age Group.Source: Researcher's Construction.

- Years of Experience;

The graph (7) reveals that 90% of the investigated sample have the experience between 11 and 15 years. This is followed by the third group of people with over 16 years of experience, which is constituting 10% of the sample. This distribution very much highlights the high engagement of the study sample in Saudi Arabian education sphere. It determines pretty much the quality, distinctiveness and relevance of the answer.

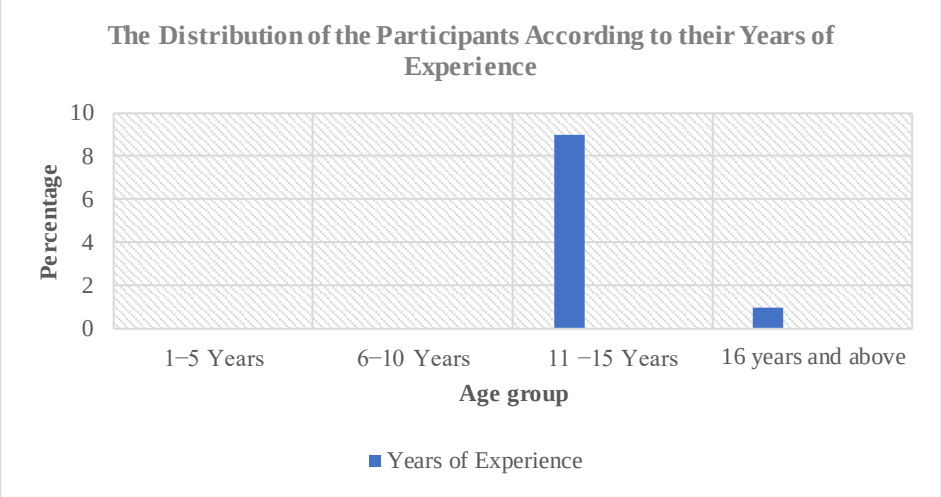

Figure (7): The Participants' Distributions Based on the Years of Experience.Source: Researcher's Construction.

5.2.2 Second Segment: Analyzing the Questions of the Interview

The interview questionnaire comprised solely of open-ended questions, which were deliberated upon with a diverse range of governmental entities, experts, and specialists in the metaverse across Saudi Arabia. There was a unanimous consensus among them that adopting the Metaverse is essential for enhancing educational methodologies within Saudi Arabian schools. Below, we present an analysis of the structured discourse questions: The discourse questions have been methodically analyzed in the order outlined below: The subjects will be addressed in the sequence mentioned subsequently:

- **First Inquiry;**

How adequately does the educational sector in the Kingdom of Saudi Arabia meet the necessary conditions for the effective deployment of metaverse technologies?

- Network Development;

The findings highlighted that a robust internet network stands as a critical prerequisite for the effective adoption of metaverse technologies within the educational domain. It was established that the Kingdom of Saudi Arabia boasts a sophisticated infrastructure in terms of its servers and internet connectivity.

- Business Environment;

The results indicated that for metaverse technologies to thrive in the education sector, a critical element is the existence of a technical and digital ecosystem conducive to these technologies. Looking at the Kingdom of Saudi Arabia, the business landscape is notably shifting towards digitalization, a trend that has accelerated since the initiation of Vision 2030. Moreover, Saudi society is characterized by a prominent digital culture.

- Previous Experiences;

The report further highlighted that the efficacy of remote learning was demonstrated, particularly in the Kingdom, during the COVID-19 era, acting as a fundamental cornerstone for the advancement of metaverse technologies within the educational sector. The face-to-face campus activities conducted in Saudi Arabia provided an exceptional experience for participants.

- **Second Inquiry;**

To what degree does the educational infrastructure in the Kingdom of Saudi Arabia comprise the essential infrastructural elements required for the integration of metaverse technologies?

- Digital Education;

According to the responses, the education sector in the Kingdom of Saudi Ar bia is adequately digitized, albeit not exceptional. As a result, one of the infrastructure components that facilitates the implementation of metaverse technologies in the Saudi educational sector is the digitization of education.

- Students and Teachers;

The research results indicate that the education sector in Saudi Arabia is severely deficient in critical super structural and infrastructural elements pertaining to metaverse technologies. These deficiencies are most pronounced in the pupil and teacher components. Insufficiency in training and credentials for educators and learners alike may detrimentally affect the caliber of education when metaverse technologies are utilized, potentially leading to detrimental consequences that endanger the realm.

- Policies and Legislation;

The findings indicate that focusing solely on emergency situations in the education sector and implementing hasty policies and legislation will not result in the successful implementation of metaverse technologies in the field of education. This was abundantly apparent during the COVID-19 pandemic, when prompt action was taken in lieu of implementing established strategies and policies that advocate for the progressive digitization of the education sector. Hence, policies and legislation are required to propel the educational sector towards aligning with swift global advancements and transformations while providing assistance to all students, particularly those who are disadvantaged or encountering obstacles.

- Information Technology;

A considerable percentage of educational institutions throughout the Kingdom of Saudi Arabia, particularly public schools, are deficient in the essential technological infrastructure required to utilize information and communication systems. In the education sector, the technological and communication infrastructure is among the most vital infrastructures necessary to realize the maximum potential of metaverse technologies.

- **Third inquiry;**

How might technologies pertaining to the metaverse be implemented to enhance the standard of education?

- Improved Communication;

The feedback indicated that the utilization of metaverse technologies has a beneficial impact on the exchange of information between educators and learners, thereby directly influencing the standard of instruction. Enhanced communication serves to fortify and differentiate the results of the educational process.

- Outstanding Immersive;

Education an exceptional level of student immersion in learning has been identified as one of the most distinctive characteristics of metaverse technologies and their influence on the quality of education, according to an analysis of the data. This results in substantial advantages that contribute to the improvement of the educational system on a national scale within the Kingdom.

- **Fourth inquiry;**

How might technologies pertaining to the metaverse be implemented to enhance the standard of education?

According to the findings from the conducted interviews, an overwhelming majority of the study participants hold the belief that the utilization of metaverse technologies in the education sector has a substantial and positive impact on education quality. The analysis of the most notable responses from the participants is provided below:

- Improved Communication;

The feedback indicated that the utilization of metaverse technologies has a beneficial impact on the exchange of information between educators and learners, thereby directly influencing the standard of instruction. Enhanced communication serves to fortify and differentiate the results of the educational process.

- Exceptional Immersive Education;

According to an analysis of the data, students' exceptional immersion in learning is one of the most distinguishing characteristics of metaverse technologies and their impact on the quality of education. This results in substantial advantages that contribute to the improvement of the educational system on a national scale within the Kingdom.

- Integration;

The findings indicated that the implementation of metaverse technologies would have an immediate effect on student integration, which is a substantial concern in the realm of digital and electronic education. Prior experiences have encountered the difficulty of fostering student integration both within the student body and between instructors and pupils. By utilizing metaverse technologies, this obstacle can be surmounted, leading to a more effective enhancement of the education system as a whole and a subsequent improvement in pupil performance.

- **Fifth inquiry;**

To what extent do metaverse technologies contribute positively to educational achievements in the Kingdom of Saudi Arabia?

- Academic Achievement of Students;

The findings suggest that metaverse technologies exert a substantial influence on the academic performance of pre-university learners, specifically with regard to their academic accomplishments.

- Students' Knowledge and Comprehension;

According to the results, students' knowledge and comprehension are among the most significantly impacted areas by the implementation of metaverse technologies in the education sector. Metaverse technologies significantly augment the comprehension and knowledge of students.

- Enhancement of Students' Cognitive and Mental Capabilities;

The findings indicate that the implementation of metaverse technologies improves the academic achievements of students through the cultivation of their cognitive and mental capabilities. These abilities serve as indicators of educational quality in the Kingdom of Saudi Arabia and are regarded as crucial results of the educational process.

- **Enhancement of Students' Professional Proficiency;**

The findings suggest that a significant influence of metaverse technologies on academic achievements is the cultivation of students' professional competencies, particularly in STEM and related disciplines.

- **Sixth inquiry;**

What are the barriers and complexities associated with the integration of metaverse technologies into educational institutions within the Kingdom of Saudi Arabia?

- Inequality;

The responses gathered suggest that student inequality will be one of the most significant obstacles the educational system will encounter if it adopts the metaverse. The COVID-19 pandemic brought considerable attention to this difficulty.

- School Infrastructure;

The findings indicate that the primary obstacle to implementing metaverse technologies in education, particularly in public institutions, is the infrastructure of the school. Certain educational institutions within the Kingdom are beset by an extreme deficiency in the digital infrastructure required to facilitate the transition to metaverse technologies.

6. Conclusion and Contributions

The study's conclusions, based on key themes, serve as the ultimate goal of the research.

6.1. Conclusions of the Hypotheses

The application of metaverse technologies in Saudi Arabia's education sector has shown a positive impact on quality. The country has the necessary technological infrastructure for successful implementation, but schools lack it, indicating a need for infrastructure development. Although curricula can be transformed into digital curricula, there is a lack of distinguished technological

infrastructure in educational institutions. The superstructure, including curricula, teachers, programs, and scientific data, can help adopt metaverse applications and improve education quality. However, the teacher element may pose a challenge to the superstructure, requiring measures to enhance their level. Therefore, the Kingdom of Saudi Arabia needs to invest in technological development to fully harness the potential of metaverse technologies.

6.2. Conclusions for the Inquires

The Kingdom of Saudi Arabia has the potential to adopt metaverse technologies to improve school education quality. With advanced servers, web networks, and a well-developed technical environment, the country has the necessary infrastructure. However, challenges such as student inequality, inadequate infrastructure readiness in schools, and a shortage of digital infrastructure need to be addressed. The introduction of metaverse technologies could enhance communication between students and providers, enhancing student immersion in the learning process. Further development is needed to overcome these obstacles and improve the quality of education in Saudi Arabia.

6.3. Scientific Contributions

The study lays the groundwork for future research, potentially enriching scientific inquiry and introducing a new area. It aims to contribute to the development of the education sector in Saudi Arabia through modern technologies, making the process more flexible and agile, especially during crises. This development will benefit all levels of the education system.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest: No potential conflict of interest was reported by the authors.

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