An-Najah National University

Faculty of Graduate Studies

EXAMINING THE READINESS OF THE PALESTINIAN LOCAL MARKET TO ADAPT TO THE EXTENDED REALITY TECHNOLOGY VIA ACADEMIC-INDUSTRIAL PARTNERSHIP

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Dedication

Thank God for this achievement

I dedicate this work to my parents

My brothers

All my family

All my friends and colleagues

Acknowledgements

I am happy to thank everyone who contributed to it, even in a simple way, and I am happy to thank Professor Allam Mousa, who was greatly credited with illuminating the path of the search for me through his guidance and advice. Allah made it in the balance of his good deeds.

I would like to thank all my teachers in the engineering management program at An-Najah National University who facilitated my ability to complete and apply this study.

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I would like to thank all the people who have devoted part of their time to filling out the questionnaires.

I would like to thank everyone who helped me with this study.

Declaration

I, the undersigned, declare that I submitted the thesis entitled:

EXAMINING THE READINESS OF THE PALESTINIAN LOCAL MARKET TO ADAPT TO THE EXTENDED REALITY TECHNOLOGY VIA ACADEMIC-INDUSTRIAL PARTNERSHIP

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

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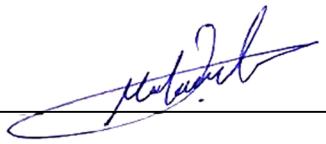
Signature: 

Date: 26/6/2024

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Abstract

The rapid development of Extended Reality (XR) that consists of virtual reality (VR), augmented reality (AR), and mixed reality (MR) technology holds immense potential for various industries to revolutionize their operations. However, successful adoption of XR requires a market that is prepared to integrate this new technology. This thesis investigates the readiness of the Palestinian local market to embrace XR.

This research proposes a model to assess the local market's readiness to adopt extended reality technology. The research utilized the questionnaire and interviews as quantitative and qualitative approaches, respectively. The study covered the research community, with 80 samples representing the Palestinian government as well as private institutions and companies. The researcher distributed and analysed questionnaires using the SMART-PLS program, as well as conducted manual analysis of 20 interviews with different institutions.

The model consists of eight variables: training, trainees, innovation readiness, strategic readiness, and resource readiness, which are independent variables; organizational performance and industrial-academic partnership (IAP), which are intermediate variables; and the organization’s readiness to adapt to the technology of extended reality, which is a dependent variable.

The study concluded that the Palestinian local market is already ready to adapt XR technology, and the interviews provided an insight into the opinions of Palestinian institutions with XR technology, the obstacles that exist, and how to overcome them through the industrial-academic partnership. The study revealed the local market's interest in XR technology across various sectors, particularly the engineering sector, despite the

challenges faced by each sector, including material constraints and a shortage of qualified human resources. The study confirmed that the industrial-academic partnership will help overcome these barriers and challenges by providing training and addressing material obstacles.

Accordingly, the researcher recommended establishing industrial academic partnerships, providing the necessary resources to adopt this technology in all sectors, and supporting start-up companies in this field.

Keywords: Extended Reality, Readiness to Adapt, Industrial-Academic Partnership, Local Market.

Chapter One
Introduction

1.1 Overview

Imagine a world where learning transcends textbooks, tourism transcends brochures, and businesses transcend physical limitations. This world is on the horizon, propelled by the transformative power of Extended Reality (XR) technology. However, for this potential to become reality, a critical question arises: is the Palestinian local market ready to adapt XR?

Extended Reality (XR) is a cutting-edge technology that blends the real and virtual worlds. This term includes virtual reality (VR), augmented reality (AR), and mixed reality (MR), each offering distinct experiences ranging from fully virtual environments to additions to the real world. XR applications span diverse sectors, from entertainment and gaming to education and healthcare, where XR can power innovative solutions for training, education, design, and entertainment (Elias et al., 2019).

Extended reality applications have transcended computer games and programmers' imaginations. they are now a vivid reality in education and training, engineering, design, architecture, security, defense, medicine, entertainment, and other fields. It opens new worlds for humans' ambition that allows them to overlook a hypothetical world in which to unleash their ideas, expand their horizons, and gain experiences that may be difficult or impossible to acquire in objective reality and to achieve goals as long as they have imagined.

For example, would you like to explore the surface of a planet like Mars or Saturn? Would you like to fly a drone? Can you perform surgery before becoming a doctor? Also, do you want to build your designs, test them, and present them to others to express their opinion on them and even test and deal with them? (Pallavicini & Bouchard, 2019).

Organizations are rushing to enter the world of extended reality and are looking for opportunities through which to achieve excellence (Roos et al., 2020). Exploiting these opportunities and using them does not come by chance but rather requires prior strategic planning for the institution's work and creating partnerships between organizations, such

as the academic-industrial partnership. Therefore, it is necessary to know the ability of the Palestinian local market to adapt to the extended technology.

The use of virtual reality in the educational process has an effective and attractive effect because it provides the learner with a variety of virtual educational environments that are difficult to access in the real environment (Ahir et al., 2020). Medical students can look at very minute details in the human body, such as the heart. Students can see it virtually from all sides, from the inside and outside, and see the work of the valves and how blood flows in the heart and the human body (Pottle, 2019).

Engineering students from all disciplines can use extended reality technology to solve engineering problems. Mechanical engineering students, for example, can learn about the parts of machines and how to use them through this technology. This technology also helps art students to facilitate their studies by simulating works of art and how to create them. It also assists students of the arts by providing three-dimensional lessons about geographic regions and simulating some historical events, among other things (Delgado et al., 2020).

1.2 Problem statement

The adoption of Extended Reality technology has the potential to revolutionize several different local industries in Palestine, including the healthcare, tourism, education, and entertainment sectors. However, integrating XR technology successfully requires overcoming several barriers and difficulties. There are many obstacles preventing the use of extended reality, such as the lack of qualified personnel for training in extended reality technology, the lack of extended reality devices, and the lack of training materials or strategic plans for adoption.

The goal of this study is to determine whether the Palestinian local market is prepared to adopt XR technology and to pinpoint any barriers that might prevent its widespread adoption. The study will look into the potential advantages of encouraging academic-industrial collaborations to help Palestine adopt and develop XR technology. This will make it possible to deal with the difficulties that have been raised.

This study will provide insights and recommendations that can assist policymakers, businesses, and academic institutions in Palestine in developing effective strategies for

adopting extended reality technology. By leveraging academic-industrial partnerships, this study seeks to foster an ecosystem that facilitates the adoption of XR technology. Such an ecosystem would be responsible for driving innovation, economic growth, and enhanced experiences in a variety of Palestinian market sectors.

Therefore, due to the spread of this technology and the possibility of employing it in many fields, it has become possible to exploit the extended reality technology in establishing businesses and working to invest in and through this technology, in addition to establishing companies that exploit such technologies (George et al., 2021). It can also be exploited in research and development, which will reflect on the development and prosperity of the economy.

With the rapid development in the technological field, it was inevitable that the marketing plans of companies and their areas of interest would be affected. Chances of success will diminish if traditional thinking does not change, and yesterday's mentality does not work today. Therefore, today, this technology must be used to communicate an image of the product to the consumer in an effective manner (Melović et al., 2020).

Extended reality technology represents a new challenge for companies not only in Palestine but in the whole world in their ability to deal positively with it and to know the extent of its impact on individuals and institutions (Dwivedi et al., 2022). Therefore, the use of this technology requires great effort, and investment in this technology must be accelerated to develop companies and do professional marketing.

Virtual Reality and Augmented Reality are relatively new ideas that have just emerged at An-Najah National University (ANU), one of the first institutions in Palestine to establish some related centers. To get the most out of this technology and speed up development and learning in developing countries, it is important to understand its importance, how it can be used in education at all levels, and how it can be used in different industries. Therefore, this research will assess the readiness of the local Palestinian market to adapt to extended reality technology.

1.3 Research questions

The primary focus of this thesis is on the following main research question:

- Is the Palestinian local market ready to use extended reality technology?

  sub-questions follow the main research question, and they are:
- To what extent can academic-industrial partnerships bridge the gap between existing XR technology and the needs of the Palestinian local market?
- How can academic-industrial partnerships in Palestine promote the development of appropriate XR content and ensure global accessibility?

Surveys and interviews will be conducted with companies, consumers, and academic institutions to measure their awareness and understanding of XR technology, show the relationship between the industry and the academic sector, and find out the possibility of adapting the local market to extended reality technology. In addition, the extent of stakeholder familiarity with the use cases of XR and the potential benefits in different sectors will be researched, and we will analyse the data to determine the level of awareness. Any knowledge gaps or misconceptions will be identified. The current technological infrastructure in the Palestinian local market will be assessed, and stakeholders will be interviewed to understand their views on collaboration and knowledge transfer.

1.4 Importance of study

In a time when technology is a big part of our lives, when the development of apps and technologies is speeding up, when smart devices like phones, iPads, and others make it easy to get any kind of information, and when our world is turning into virtual ones where each person lives, roams, travels, learns about things, and studies, it is necessary to make the best use of these technologies.

Under such conditions, one of the most recent and most important technologies is Extended reality technology, which will take all sides of life (including education, health, trading manufacturing...) to a new and more advanced level. Extended reality technologies have come in many forms that we can use to help science, students, teachers, industrialists, farmers, traders, and more. Hence the importance of XR in our lives. Understanding the impact of XR technology on different categories of people, like

students, teachers, and industries, is an important factor in determining the readiness of Palestinian industries to adapt to extended reality technology.

A clear benefit of incorporating XR into education is that it gives students access to educational environments that are otherwise out of reach. For example, students can look at volcanoes through XR headsets and can see planets and interact with them. Medical students can contemplate human organs and how to deal with them through XR technology(Pottle, 2019).

The importance of XR in the industry is also evident, as many industries are already using XR in their day-to-day operations (Zabel & Telkmann, 2021). For example, the automotive sector uses advanced simulation and visualization tools in the manufacturing process. Simulation findings, such as in technical analysis, scientific visualisation of fluid dynamics, or crash analysis data, may be evaluated in a more realistic manner using XR technology in this subject. Also, as a driver-training tool, this technology is being utilised to simulate real-life situations and teach safe driving. This is a way to market and sell cars so that buyers can enjoy what it's like to drive different kinds of cars (Gardelis et al., 2018).

In marketing, it's always a good idea to keep up with the latest trends, so marketing through XR is very popular right now. Just seeing a XR headset will get people interested in what's on the screen, making it easy to reach more possible customers (Hamad & Jia, 2022).

The public and media interest in XR will give the marketing campaign a huge boost and give it more credibility, which will lead to more people joining (Bojic, 2022).

People see many ads every day, but they don’t want to buy products because people are bored with ads like outplayed videos, etc., which can cause large ad campaigns to fail. So, the best way to make ads that people will remember is to combine advertising with entertainment. Because of this, marketing campaigns for brands that use XR will be more interesting, which will help them get more customers (de Regt et al., 2021).

It is possible to simulate any kind of medical emergency by Using XR to put students in a realistic situation, and then providing them with feedback and debriefing so they can grow from their experiences (Pottle, 2019). Adaptable and extensive Through the use of

XR, doctors can see previously inaccessible parts of the human body. Medical students no longer must perform autopsies; instead, they can use XR to learn about human anatomy (Zhao et al., 2020). Thanks to advancements in computer graphics, it is now possible to accurately recreate any anatomical structure. Also, training can be provided through scenarios that accurately reflect real-world surgical conditions (Cooper et al., 2021).

1.5 Research objectives

To answer the research questions accomplished in a previous section, the following objectives should be achieved:

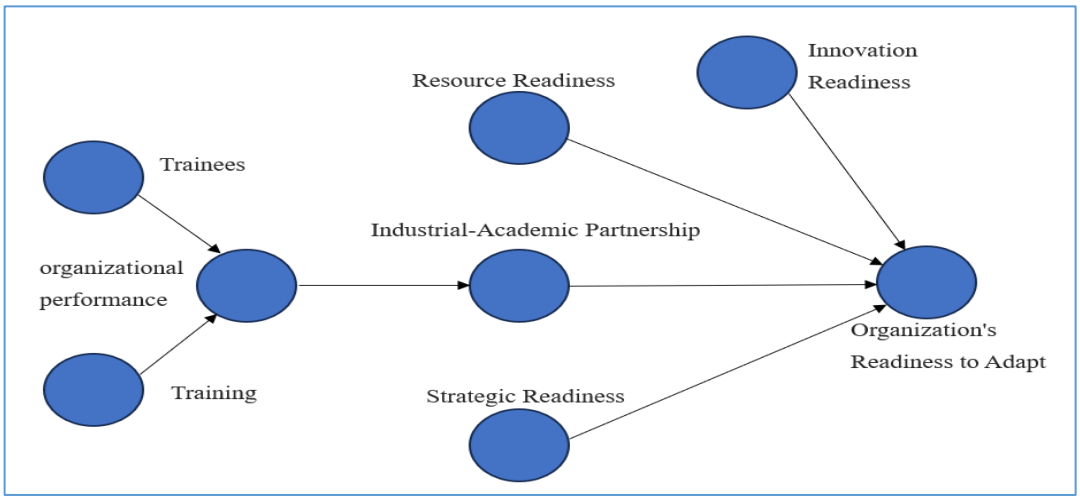
- Examining the readiness of the Palestinian industries to adapt to an extended reality of technology
- Demonstrating the role of the academic-industrial partnership in helping Palestinian institutions adapt to the technology of extended reality
- Determine the importance of using extended reality for educational institutions in Palestine.
- Determine the importance of using extended reality for industries in Palestine.
- Knowing the community's awareness of the extended reality technology
- Determine what the Palestinian local market has in terms of technological resources and infrastructure needed to support XR technology.
- Identify barriers to XR adoption by businesses and consumers, and identify how to overcome these barriers.
- Determine which Palestinian economic sectors have the potential to adopt XR

1.6 The development of the theoretical model

After defining the problem and collecting data, a model was built containing eight variables as shown in Fig 1.1. Five of the variables are independent variables, which are training, trainees, innovation readiness, strategic readiness, and recourse readiness; two mediating variables, which are organizational performance and industrial-academic partnership; and one dependent variable, which is organizations' readiness to adapt.

Figure 1.1

Proposed Research Model



Based on the literature, hypotheses were made to find out if the Palestinian industries are ready to adapt an extended reality technology, what role the academic-industrial partnership plays, and what other factors (innovation readiness, strategic readiness, and resource readiness) affect the adoption of an extended reality technology. Accordingly, the following hypotheses were developed:

H1: There is no statistically significant positive effect of trainees on organizational performance.

H2: There is no statistically significant effect of training on organizational performance.

H3: There is no statistically significant association between organizational performance and the existence of an industrial-academic partnership.

H4: There is no statistically significant effect of an industrial-academic partnership on the organization's readiness to adapt.

H5: There is no statistically significant effect of innovation readiness on the organization's readiness to adapt.

H6: There is no statistically significant effect of resource readiness on the organization's readiness to adapt.

H7: There is no statistically significant effect of strategic readiness on the organization's readiness to adapt.

Chapter Two

Literature Review

2.1 Overview

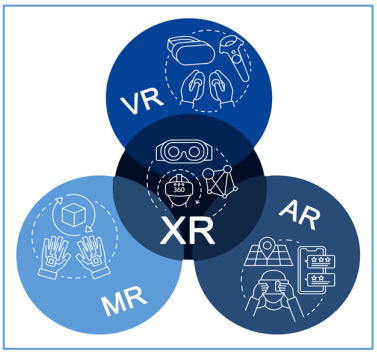
The present chapter will explain various forms of extended reality, namely virtual reality, augmented reality, and mixed reality. Additionally, it will examine the impact of extended reality on Palestinian industries and underscore the significance of strategic planning in harnessing this technology. Furthermore, the variables and hypotheses of the model will be explained.

2.2 Extended reality

The concept of extended reality encompasses augmented reality (AR), virtual reality (VR), and mixed reality (MR) as shown in Fig 2.1. This involves the integration of computer graphics and human interaction to create a seamless blend of real and virtual reality, utilizing virtual, augmented, and hybrid technologies (Kaplan et al., 2021).

Figure 2.1

Extended Reality Components



The utilization of Extended Reality (XR) technology provides a secure and controlled virtual setting for individuals to acquire knowledge and skills, without exposing them to any potential harm. This technology also facilitates the simulation of high-risk scenarios for professionals such as medical practitioners, firefighters, and pilots, with minimal costs and losses in terms of resources and human life. The acquisition of experience proves beneficial in a multitude of exigent circumstances (Casini, 2022).

Extended reality has been a big, important, and even useful part of how the education system has grown and changed (Hamilton et al., 2021). This is because modern learning

tools like screens, electronic glasses, and computers have been used to teach students in more advanced ways.

Because of this, it is important to train both the teachers and the students how to use this technology in education and to put it to use when making educational plans. So, institutes must train a group of educators who can explain and make the modern curriculum easier to understand. This improves the performance of both students and teachers, who must also work on the system for evaluating students by using electronic files to evaluate the student and strengthen the relationship between the student and the teacher (Susilawati et al., 2022). Advanced open-source educational resources are important for the education system, and both students and teachers should be able to use them.

The new world that uses modern technology in the industry should know that it's not just about creative ideas and smart software. It also needs a group of workers to monitor and run operations. Recently, (Rutkowski et al., 2021) said that video games improve hand-eye coordination, which is a skill that hundreds of computer operators need. Those who run industrial operations now are in desperate need of it. So, to get the best results, the extended reality must be made to adapt to the industry.

In the future, consumers will find great ease and comfort in making purchases with the help of extended reality technologies. These gadgets make it possible to attend events anywhere in the world from the comfort of your own home, via the Internet.

Extended reality technology, for instance, might be used to display text that you could only see through your glasses on billboards along streets and buildings. There will be a fresh movement in the future years toward developing digital simulations for use in anticipating weather and climate change-related crises. Mentalists speculations a robot can hold a natural conversation with a person, respond to human commands, learn from past interactions, and display astonishing facial emotions.

Extended reality aims to take advantage of human participation and interaction with computerized devices on the one hand and with human counterparts located in other places through visual and audio communications that bring together the two parties in a direct meeting that simulates the real meeting with high accuracy and makes those who watch the meeting feel as if they are in one place.

2.2.1.1 Virtual reality

Given today's tremendous advancements in all facets of life, and as a result of the intense rivalry to find new products, scientists have succeeded in creating a new world, one that may be seen as a counterpart to the current one: the virtual reality world. Through a virtual reality environment, a person can interact with an environment produced by a computer using many technologies and techniques (Huang & Liaw, 2018). Virtual reality technology has become widely used in many industrial, educational, military, and even video game fields (Ahir et al., 2020).

Many researchers defined virtual reality as a convincing portrayal of a world that doesn't exist, it is possible for the user to freely roam about a virtual world created by hardware and software components working together. It is now possible to interact with and "live" in virtual reality thanks to specialized VR viewers and peripherals. To the user's eyes, a three-dimensional virtual world appears real (El Beheiry et al., 2019).

Gironacci, (2021) defined VR as a lifelike simulation of an alternate reality that does not exist, it is the result of a collaboration of hardware and software components that "collaborate" to create a virtual area in which the user can freely travel, Virtual reality viewers and accessories designed expressly for interacting and "living" in virtual reality enable access to this digital world.

Kohli et al., (2022) say that in virtual reality, computer technology is used to simulate the environment, so viewers become integrated and able to interact with 3D science with ease without the screen in front of them. You can simulate the largest number of senses used, such as sight, touch, smell, and hearing, so the computer is now the gatekeeper to enter the artificial world.

Virtual reality devices contain a lot of technology and features for example In virtual reality technology, components can be represented through the screen that is mounted above the head, so the display technology has a difference and is different from the traditional old user interfaces (Jin et al., 2022). And we can see data for virtual content on screens the size of the room. which is a great help for students in universities or workers in large laboratories.

Virtual reality technology also contributes to many areas, if not all. Consider how much more interesting the class would be if they included a virtual reality tour in the lesson

bundle, such as teachers there are warming to the idea of using virtual reality and augmented reality tools to help teach their lessons, with more interest emerging from the fields of science (Chen & Liu, 2020), history, and engineering (Iatsyshyn et al., 2020).

The devices of VR are now wearable and different types of virtual world glasses and advanced wearable devices can be worn (Pellas et al., 2021), and there are many applications for people with learning disabilities who might struggle in a typical classroom setting, A virtual reality headset allows struggling learners to get the environment they need to learn correctly (Bjekić et al., 2020).

Using computer-generated visual and aural effects, virtual reality (VR) and augmented reality (AR) technologies create a whole new scenario that can't be touched but can be felt and heard.

Although both VR and AR aim to simulate the real world, the resulting virtual realities are distinct. Virtual reality (VR) is a computer-generated simulation of a different world or reality, typically employed in three-dimensional media such as films and games.

This technology allows users to immerse themselves in a 360-degree digital environment while blocking out all external stimuli using headphones (like the Oculus Rift) (Lee et al., 2021). Users of virtual reality systems are immersed in the action. Users, rather than staring at a screen, are transported into this environment and can interact with it in three dimensions through the use of sensory simulations that include sight, sound, and smell.

The goal of virtual reality is to "immerse" the user in a simulated environment by isolating them from their physical surroundings through the use of computers and sensory devices like headphones and gloves (Asaad, 2021). The most common virtual reality devices are the HTC Vive, Oculus Quest, Samsung Gear VR glasses, and Google Cardboard.

In virtual reality, computer technology is used to simulate the environment despite the old interfaces, as it puts the user inside the experience, so the viewers become immersed and able to interact with the three-dimensional science with ease, without the screen being in front of them only (Challenor & Ma, 2019).

Computer-generated virtual reality (VR) immerses the user in a synthetic three-dimensional space that moves and reacts to physical reality. Displays are often worn on

the user's head, and gloves with touch-tracking technology are used to control the device (Gandhi & Patel, 2018).

Czernuszenko et al., (1997) say Virtual Reality (VR) is a technology that allows the creation of an environment similar to reality using a computer, using a computer screen, stereo speakers, or glasses. It works by showing a picture that looks like reality in places where people can't go or make things.

Talbot et al., (2012) say the use of virtual reality (VR) technology has expanded far beyond the realms of entertainment and gaming to include academic and medical settings. Surgeons utilize this tool for preoperative planning and surgical rehearsal, and the military has utilized it to replicate the effects of extreme weather on training exercises.

2.2.2 Augmented reality

Through the use of Augmented Reality (AR), digital information is superimposed on the real world, creating a new experience that combines the tangible and sensual with digital information. Asaad, (2021), and composed entirely of non-physical components that we can see, hear, and interact with, but not touch. It is among the most popular applications, filters for social media applications.

Augmented reality is the use of a computer as a sensor and algorithms to determine the direction and position of the cameras (L. Chai et al., 2002). AR technology can show three-dimensional graphical interfaces through the camera, which causes images to be superimposed through the computer and shown to the user in a real-view image.

Augmented reality (AR) is a technology that uses your surroundings and augments them with computer-generated or digitally-generated content to create an immersive, convincing virtual environment (Rauschnabel, 2021). When seen through a mobile device, it gives digital content (films, images, links, games, etc.) the appearance of being physically present. Also, (Petrov & Atanasova, 2020) define augmented reality as the process of adding digital layers to our perception of the physical environment. Just like what you saw in "Iron Man" in terms of how characters interacted. To superimpose virtual items onto the real world, devices equipped with cameras or sensors must first map and define the outside world.

Among the applications of augmented reality, the user can, for instance, look up nearby restaurants as they appear on a three-dimensional display of the user in real-time as he travels the roads, all thanks to the use of augmented reality to identify information or data through layers of scenes that appear to him in real reality (Parekh et al., 2020).

2.2.3 Mixed reality

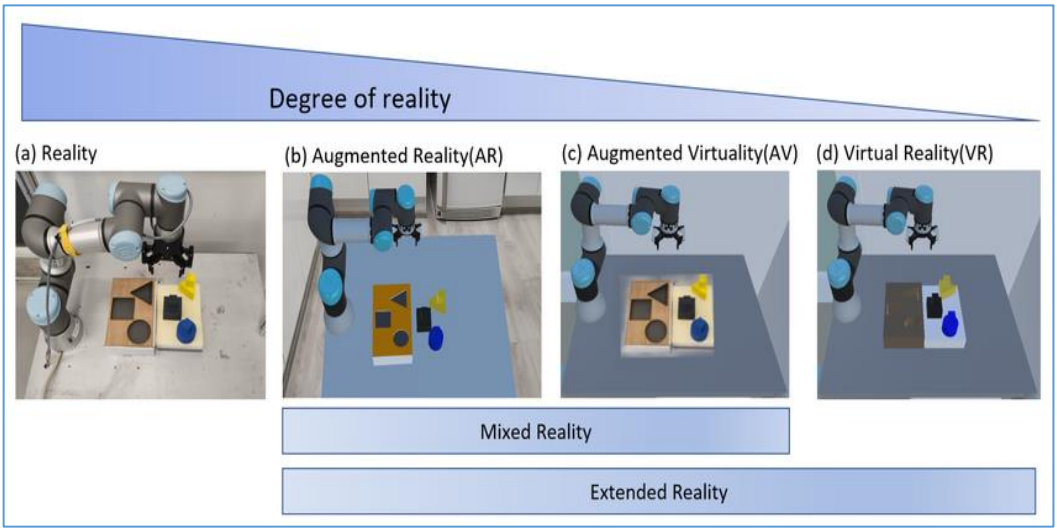
Sometimes called "hybrid reality," this innovative technology combines the advantages of both virtual and augmented environments as shown in Fig 2.2. In this setting, you can interact with virtual things that have been placed in the real world. User interaction is maintained as digital elements are superimposed on the physical world.

Mixed reality technology enables the preservation of the authentic physical environment while incorporating virtual elements within it. Mixed reality offers the capability to manipulate virtual elements within a given scene, enabling the user to adjust their dimensions and spatial location. This functionality expands upon the existing features of augmented reality, allowing for a more immersive experience (Venkatesan et al., 2021).

Mixed reality technology facilitates the integration of diverse components, such as tracking head movements to simulate a person's presence in a realistic environment and utilizing sensors to survey the surfaces within a room. Furthermore, the surveillance of the luminosity and acoustic levels within the proximate milieu. The identification of objects and the determination of their location are also encompassed within the components of mixed reality. A genuine mixed reality encounter is established through the amalgamation of computer processing, human cognition, and the surrounding environment (Zhang et al., 2020).

Figure 2.2

Real Environment to Virtual Reality



2.3 The role of extended reality in the development of industry in Palestine

Many important things extended reality does to help the industry grow, such as better training and skill development, which gives employees training environments that are immersive and real, so they can practice and improve their skills in a place that is safe and under control. It also has the potential to make training programs more effective in many different areas, such as industrial simulations, medical procedures, and the use of complex machinery. This can then lead to more skilled workers and more work being done.

Extended reality lets professionals in fields like architecture, engineering, and product design see and change their ideas in three dimensions. This will make design and visualization better and will let stakeholders try out virtual prototypes and give feedback on them. This improves teamwork, cuts down on design mistakes, and speeds up the development process as a whole (Taniguchi et al., 2022).

XR has the potential to give customers interactive and personalized shopping and marketing experiences. AR applications, for example, let customers virtually "try on" products. This makes customers more interested and helps them make better buying decisions (Feng et al., 2019).

in medicine XR is changing the way medical training is done, as well as how surgical procedures are planned and carried out and how patients are cared for. Surgeons can

practice complicated procedures in virtual environments, and other medical professionals can use augmented reality (AR) to add information about a patient while treating them. This leads to better results and a safer experience for the patient (Venkatesan et al., 2021).

Also, XR is used to help workers follow assembly instructions and see data in real-time, which speeds up the manufacturing process. This lets XR help streamline the process of making and putting things together. This makes manufacturing industries more productive, reduces the number of mistakes, and improves quality control.

One way that XR is changing education and makes it more accessible is by giving students learning experiences that are both interactive and interesting. By giving them tools like immersive historical simulations and digital field trips, XR helps students understand and remember hard topics better.

In the research and development field, extended reality (XR) lets scientists and engineers do tests and simulations that might not be possible in the real world. This could speed up innovation and help scientists make progress in several different fields (Orr et al., 2021).

In general, XR technologies can be used in a wide range of ways that can improve productivity, innovation, and customer experience in many different fields. As these technologies continue to improve and become easier to use, they will likely have a much bigger impact on the growth of different industries in the coming years.

The industrial sector in Palestine faces a lot of problems that slow down development and make the growth process harder. So, the right priorities and steps need to be taken to make sure that all Palestinian cities have complete and sustainable industrial development. This is done by figuring out and improving each industry's competitive edge, highlighting production capabilities, and figuring out and evaluating the resources and needs in all sectors.

To move the industrial sector forward, it is important to make industrial sectors and facilities more competitive, increase production and export capacities, develop Palestinian products and increase their share locally, promote them internationally, and reach global markets. In addition, investment in human capital will increase productivity and competitiveness. Also, the business environment can be improved and promoted.

Investing in the industrial sector and supporting innovation and creativity to advance the industrial sector

The industrial sector also has a lot of strengths and opportunities, especially in making furniture, shoes, stone, traditional and craft foods, plastics, etc. In addition to infrastructure, which includes electricity, water, a road network, communications, and private centers for industrial services like maintenance, machinery manufacturing, and exhibitions, there is a large population with a wide range of specializations and interests.

To get the most out of modern technology, such as extended reality technology, it needs to be used in training, design, development, and expanding production lines. Integration of this available modern technology and strengthening it with the necessary tools while providing the necessary training for operation are in addition to using this technology in marketing and strengthening the information technology industry sector, as well as integrating such technology in the industrial sectors to maximize performance and productivity levels through launching pilot programs (Cardenas-Robledo et al., 2022).

So, centers for skill development and training should be set up so that extended reality technology can be used in manufacturing, design, product development, and marketing. For example, fashion design is one of the most prominent industries in Palestine. Through extended reality technology, we can continuously explore the latest international trends in fashion, thus determining other materials and additions through the Product Development Center.

Labor development service centers should also be set up to train and certify people in management, planning, marketing, finance, production, and other services using extended reality technology and other technologies.

It is also very important to develop specialized and modern vocational training, education, and qualification, as well as to set up specialized vocational training centers that use extended reality technology to improve the skills of workers in the sectors, provide qualified workers, and set up vocational programs through partnerships with universities. In addition to helping workers learn how to make plans, market their products, and sell them abroad, the industrial sector:

Also, vocational training centers should be set up with specialized and updated programs to qualify human resources for the necessary professional cadres, encourage leadership, and create a link between local universities and the local market to come up with new and useful ideas that fit the work and needs of all sectors.

Another side is the tourism sector in Palestine which has a lot of unique characteristics. There are many archaeological tourist attractions in Palestine that many people are ignorant of, and these attractions occupy a religious place for people, such as the Al-Aqsa Mosque in Jerusalem, the Al-Ibrahimi Mosque in Hebron, and the Church of the Nativity in Bethlehem. These monuments, themselves are a national treasure if properly exploited.

In addition to the many scenic landscapes that spread in Palestine from its north to its south and the presence of the oldest city in the world, the city of Jericho, which can be exploited through medical tourism. So, using the technology of extended reality in this sector to create virtual environments, explain their features and importance, and explain where they will help to get tourists from all over the world interested in traveling, which will increase the demand for tourism. This technology can also be used to promote the handicrafts that are typical in Palestine. This will help many professionals and skilled craftsmen in the community make more money.

Extended reality technology can also be used to improve how well farmers do their jobs by helping them learn how to do their jobs better. For example, workers can use extended reality technology to learn how to use and set up aquaponic systems. This technology also helps promote agricultural products. This technology makes it possible to grow plants, determine how much water they need, and take care of them.

Therefore, this technology will help promote farmers' experiences in addition to their products, as well as their acquisition of high levels of experience in many agricultural fields. This technology will also help in educating the public about agricultural matters and how to take care of their crops without limiting them to certain varieties, so their desire to try new varieties will increase.

Currently, extended reality technology has been used in several fields in Palestine, where it was widely used initially in the field of games and gained wide popularity as there were many models in many Palestinian governorates, such as the Virtual Reality Games Cafe in the Gaza Governorate, which constitutes a breather for the youth of the people of Gaza

under the siege imposed on them, and the "VR zone" hall in Ramallah Governorate, also the “family paradise" in Hebron Governorate, and others.

Later, it was used in the tourism sector, such as the project of the Palestinian young woman Saja Abu Dalal, which was with a group of young people and was one of the first Palestinian projects in this field. They launched the "Pal VR" project, which works on photographing tourist places with 360-degree technology. This project aims to introduce tourist places in Palestine and link Palestinian cities separated by Israeli barriers.

There was also a hackathon to encourage digital tourism in the Palestinian Technological Park in 2022, and one of the most prominent projects of these hackathons was to encourage astronomical tourism, archaeological tourism, and religious tourism using virtual reality and augmented reality technology.

Then this technology spread to include higher education in Palestine in Palestinian universities such as An-Najah National University, which established a centre for training teachers and students alike on the use of this technique for optimal and effective exploitation; the Arab American University, which introduced this technology to train nursing students to learn basic skills in the field of nursing; and Palestine Polytechnic University, which is working to develop education with these technologies in the field of geographic information systems and topography and has used this technology to restore the old town in the city of Hebron in partnership with the local community.

The use of this technology appeared in the modern school in Gaza City, where the students expressed their admiration for this technology, which helped them bring many concepts closer together. Also, one of the Palestinian companies called "InterTech" began working on the development, programming, and marketing of extended reality technologies.

2.4 Prospects for academic-industrial Partnership

The relationship of the private sector with universities is a mutual and continuous one, where the outputs of universities are inputs for the labor market and the private sector, as these inputs depend on the quality of the system of education in these universities and the quality of the outputs produced by the universities.

The partnership between the private sector and universities in research and development is a strategic partnership that benefits both parties. Any economic progress does not arise from a vacuum but rather was originally an idea and an experiment studied and then appeared on the ground as a producer, so the capabilities of laboratories, research centers, and universities are the home of first experiences. So, it is not surprising that there is a partnership between universities and the private sector because research and development laboratories are universities and institutions of higher education.

The higher the efficiency of higher education institutions, the higher the efficiency of the internal workforce in the private sector. And whenever you reduce it, it leads to weakness and remoteness; as the inputs become unsuitable for the private sector, the cost of re-equipping them increases, and their contribution to the development of the private sector decreases.

In addition, the universities' lack of understanding of the meaning of partnership necessitates holding meetings, seminars, and workshops, and activating communication largely throughout the year, away from the limelight, to activate this partnership. It is also supposed to be reserved for the private sector, which must have a say or a role in planning curricula because we still do not know what the private sector wants or the changes that are coming, brought about by partnerships with universities. Also, universities must attract the private sector and show them the importance of scientific research, and solutions must be presented to eliminate many of the problems.

2.5 Model variables

To answer the main question in this research. It was necessary to create a model to identify the role of the academic-industrial partnership in adapting extended reality technology to the local market in Palestine.

Following an analysis of the relevant published material, a model consisting of eight variables will be developed to determine the likelihood of Palestinian institutions adopting the technology of extended reality. These variables include trainees, training, organizational performance, industrial-academic partnership, innovation readiness, strategic readiness, recourse readiness, and organizations' readiness to adapt.

2.5.1 Trainees

Workers can help a company succeed, improve its performance, and foster more communication if they each do their part to maximize efficiency (Atmaja et al., 2023).

Determining the needs of the organization and the individual, selecting or designing the most appropriate training to achieve these needs, and then transferring and assessing the effectiveness of this training may all necessitate the participation of multiple people throughout the training process.

The employee's ability to perform his work and to avoid mistakes is greatly enhanced by in-service training because the employee gains new knowledge and skills necessary for his profession or because the employee is introduced to the best solutions to the problems he faces while practicing his profession.

Modern technology provides the trainees with a degree of interaction with the virtual environment (Lokuge et al., 2019; Ortiz et al., 2019), helps them achieve training goals more quickly than normal training, and provides many opportunities for practical practice. It also provides the trainees with different environments for training, helps them obtain a lot of information and experience, and raises their motivation to work on the ground (Mulders et al., 2022).

2.5.2 Training

Training refers to a systematic and deliberate endeavor aimed at equipping personnel in the educational system with specific knowledge, enhancing their skills and abilities, fostering their growth, and promoting positive and constructive changes in their behavior and attitudes. Therefore, training affects the organization's performance (Anwar & Abdullah, 2021; Saeed, 2011)

Training can be defined as the process by which an employee or teacher performs tasks by the policies, procedures, and conditions of their educational institution. The training aims to acquire knowledge and experiences, as well as gather the information that may be lacking. This process also involves developing appropriate attitudes towards work and authority, adopting behavioral patterns, acquiring necessary skills, and forming habits that enhance one's efficiency in performance.

Training is a comprehensive and ongoing systematic endeavor that seeks to enhance or cultivate an individual's knowledge, abilities, and conduct to execute their work with optimal efficiency and effectiveness. It is also characterized as a consistent and continuous undertaking throughout an individual's lifespan that aims to augment their capacity to attain a superior level of performance and professional advancement by imparting knowledge, skills, and attitudes relevant to their area of work or expertise.

Also, the term training refers to a deliberate and structured initiative that seeks to enhance the competencies, technical aptitudes, and behavioral proficiencies of staff members, thereby enabling them to perform their duties with optimal effectiveness and productivity. This, in turn, facilitates the attainment of both individual and organizational objectives with maximum efficiency. So, in conclusion, training using modern technology such as extended reality will increase organizational performance

Extended reality through training will allow people to design and assign tasks (Mulders et al., 2022), helps reduce errors during training (Papanikolaou et al., 2019), provides a large amount of information, is easy to use, gives appropriate evaluation to trainees, and helps support decision-making related to the training process (Fracaro et al., 2021).

2.5.3 Organizational Performance

Organizational performance is affected by many factors, including training (Anwar & Abdullah, 2021), and is also affected by the quality of trainees or employees (Atmaja et al., 2023).

Organizational performance is the outcome of all operations carried out by the organization, and it is a reflection of how the organization uses and invests its resources in a way that makes it able to achieve its goals. Organizational performance can be divided according to the criterion of inclusiveness into:

1. Overall performance: It is embodied in the achievements that all the functions and sub-systems of the organization contributed to achieving without a single part or element of a unit achieving them. Through overall performance, it is possible to judge the extent to which the organization has achieved its general goals, such as continuity, growth, and profitability (Yang et al., 2023).
2. Partial Performance: It means the performance that is achieved at the level of the sub-systems of the organization and its basic functions, as each sub-system seeks to achieve its own goals, not the goals of other systems (Yang et al., 2023).

Technology helps to develop human resources in the organization and enables employees to cooperate, work together, and hold meetings. It also provides informal learning opportunities for individuals, groups, and organizations, as well as some learning needs in the organization. It also works to facilitate obtaining feedback and solving some problems (Khandelwal & Upadhyay, 2021).

2.5.4 Industrial –Academic Partnership

A partnership can be successful if it is well planned and beneficial to both academic and industrial organizations (Rast et al., 2015). This can therefore lead to better organizational performance in the long run. Both parties can benefit from this partnership.

Industrial academic partnerships contribute to enhancing cooperation and innovation between the public and private sectors, which leads to economic and social benefits for both parties. Partnerships with companies provide opportunities to fund research that academic institutions may not be able to finance through their internal resources. These partnerships also allow universities to access resources and facilities that may not be

available to them, such as advanced equipment or specialised research laboratories. In addition, partnerships with companies can contribute to improving learning opportunities for students through internal training programmes, research, and collaborative opportunities. Industrial academic partnerships also help faculty members develop their research skills and update their knowledge about the latest developments in industrial fields. In addition, they promote entrepreneurship in universities through business incubation programmes and investment opportunities.

Just as industrial academic partnerships have an important role in academic institutions, they also have a similar role in industrial institutions, where partnerships with universities provide companies with access to specialised knowledge and expertise in certain fields, such as extended reality. It can also help companies develop new products and services through collaborative research and development. It also improves their operations by applying the latest technologies and innovations, in addition to acquiring talent through employment programmes and internship opportunities. Partnerships with universities also help companies improve their public image by demonstrating their commitment to innovation and social responsibility.

So, the academic sector should understand the needs of the industrial private sector and harness all education and learning inputs for students, curricula, academic researchers, and resources to achieve high productivity, which means high added value, continuous improvement, embedded sustainability, and adapting organizations to using new types of technology (Lokuge et al., 2019).

The extended reality technology, through partnerships, also provides training at a lower price compared to regular courses. Also, extended reality through partnerships provides lessons on the detailed parts of machines or buildings, for example (Hernández-de-Menéndez et al., 2019).

In addition, the partnership increases the confidence of the workers because they will experience the systems without material or physical losses through the extended reality technology. The academic-industrial partnership opens new horizons for education through extended reality technology.

The academic-industrial partnership helps solve the problems of institutions that do not rely on research and provides training at a lower price compared to regular courses

(Delgado et al., 2020; Hernández-de-Menéndez et al., 2019). The partnership also increases the confidence of workers because they will experience the systems without material or physical losses through extended reality technology. It also opens new horizons for teaching and learning (Zhang et al., 2020; Lokuge et al., 2019).

The success of industrial-academic partnerships and their impact on the performance of organizations is dependent on several factors (Lahiri & Kedia, 2009). These factors include the level of commitment from both parties, effective communication, goal alignment, and mutual trust. Both the academic institution and the industry that is involved can reap numerous benefits from a well-structured and fruitful partnership, which can ultimately lead to improved organizational performance (Zandkarimi et al., 2020).

2.5.5 Innovation Readiness

Innovation is doing something different to meet a need or a gap in the market. It does not mean doing something different for the sake of difference only, but rather to address a defect, avert a shortage, enhance a service, add a feature to a product, or improve the work of a machine. In general, innovation involves creative thinking that escapes from the traditional point of view, and given the importance of innovations in the lives of nations, peoples, individuals, and institutions, many techniques and mechanisms have developed to help innovators complete the innovation process with great results, so innovation readiness could lead organizations to adapt to new technology (Lokuge et al., 2019).

Industry-sector work with academia fosters a culture of innovation within the organization so that exposure to research and new ideas can inspire creative problem solving and the development of new solutions to challenges (Lokuge & Sedera, 2020).

Innovative readiness is a systematic process used to determine whether an organisation is ready to implement innovation. It also aims to know the organisation's capabilities and resources necessary to support innovation within the organization. It can also be used to identify any gaps in the current capabilities of the organisation.

Innovation readiness is defined as an organisation's or individual's ability to innovate. It also assesses whether they have the resources, processes, and culture to develop and launch new ideas (AlMalki & Durugbo, 2023). It considers several factors, including

leadership support for innovation initiatives, access to the necessary resources (financial, technological, and human), and encouraging a creative and adaptable work environment.

Innovation readiness is different from innovation valance. The innovation valance examines the attitude towards innovation, often at the individual level, as well as the willingness to embrace new ideas.

Innovation through this technology requires a large amount of material and human resources (Swanson, 1994; Swanson, 2011), and the exploitation of extended reality technology will encourage innovation in the enterprise. The exploitation of extended reality technology in innovation is also necessary to meet the challenges facing the enterprise (Lokuge & Sedera, 2020).

2.5.6 Strategic Readiness

One of the primary tools of administration, strategic management, helps organizations function better. A set of policies and practices adopted by leaders and management to steer the organization in a strategic direction and establish clear performance goals.

Strategic management is an administrative approach that aims to identify the strengths and weaknesses of institutions, the challenges and opportunities they face, their vision for the future, and how they will seek to achieve that vision, all while taking into account the internal and external conditions that affect the performance of the organizations.

Strategic planning analyses the organisation's strengths and weaknesses and determines whether or not it is prepared to reach its objectives, also examines external factors that might have an impact on the company and pushes organisational development and modernization forward. How well a company's strategy is planned, addressed, and laid out in proper ways that lead to solutions for critical business challenges is a major factor in the company's success. Strategic planning is a method that establishes particular goals and objectives that can be adjusted in response to shifting market dynamics; therefore, it stands to reason that an organisation's strategic planning should reflect this assumption.

An organization that wants to meet the demands of its workforce and keep up with the ever-accelerating changes in its industry should prioritize educating its employees. In-service training is extremely helpful for workers because it teaches them new information and skills that are essential to their profession or shows them the best ways

to solve problems that arise while they are working in that profession. ambitious in its pursuit of success.

The clarity of the strategy helps in achieving the objectives of the organization and helps it adapt to new technology (Swanson, 1994; Swanson, 2011; Lokuge et al., 2019). Also, the continuous development of technology among its partners helps it be strategically prepared for all changes (Lokuge et al., 2019).

2.5.7 Resource Readiness

The growth of the organization's business management, particularly in times when its duties grow as a direct result of the challenging effects of globalization and the intensification of competition with other businesses, an increase in the duties of human resources management as well as its development into multiple contexts, such as legal, economic, technological, and social, can be inferred from the existence of relationships and dependency links between employees and the firm. Therefore, for the organization to be successful, it must prepare to supply an adequate quantity of resources, which can take the form of either financial or human resources.

Organizations that demonstrate a readiness to adapt are more inclined to allocate resources, encompassing both financial and human capital, to facilitate collaborative projects and initiatives with academic counterparts. This level of dedication enhances the likelihood of achieving favorable results.

finance resource It is a term that refers to the funds available to the company to spend in the form of cash, liquid securities, and credit lines. The availability of financial resources is necessary for the company's ability to operate effectively and sufficiently to promote success (Lokuge et al., 2019).

2.5.8 Organizations' readiness to adapt

The ability to adapt arises as a result of the experimentation process that early-stage startups undertake. It is embedded in the cumulative knowledge and beliefs of individuals. But there is another approach that puts people first, namely through effective strategic planning. Accordingly, managers have an important role to play because of the choices they make that affect motivating employees to experiment in the early stages, which affects their ability to adapt more.

Organizations that display a high level of readiness to adapt become attractive partners for academic institutions and are thus more likely to engage in fruitful collaboration because they have the potential to implement and scale innovative ideas and projects.

Highly adaptive organizations can implement and commercialize research results or prototypes emerging from the partnership with high efficiency, thus strengthening the partnership and encouraging further academic-industry collaboration.

There are different tools that managers can use to guide the discovery process, which in turn leads to different levels of coping. They can hire employees with different skills; some people are more explorers than others. They can also participate in certain initiatives, such as incentive programs that promote the need for discovery.

There is a strategic trade-off between managers because they cannot be certain about future forms of technological change. Therefore, managers must do their best to anticipate what the situation may be in the future and then find a balance between performance in the short term and the ability to adapt in the long term.

The organization must enhance knowledge and awareness of new technology (Bughin et al., 2017; Pivik et al., 2002), and the organization must adopt modern technology in its work because its adoption will greatly develop the company (Davis, 1989; Venkatesh & Davis, 2000).

Chapter Three
Research Methodology

This research will use a mixed research methodology, which combines questionnaires distributed to different segments of Palestinian society to examine the local market's readiness to adapt to extended reality technology, along with interviews with stakeholders such as teachers, managers, developers, and project owners. The mixed methods approach enables the comparison of survey and interview findings where If both methods point towards similar conclusions, it strengthens the overall validity and reliability of the research (Gilchrist, 1992). Also, by combining both quantitative and qualitative data, we can paint a more complete picture of the Palestinian market's readiness for XR.

This study will provide a comprehensive picture of the potential of extended reality to bridge geographic gaps and promote education and development within the Palestinian local market.

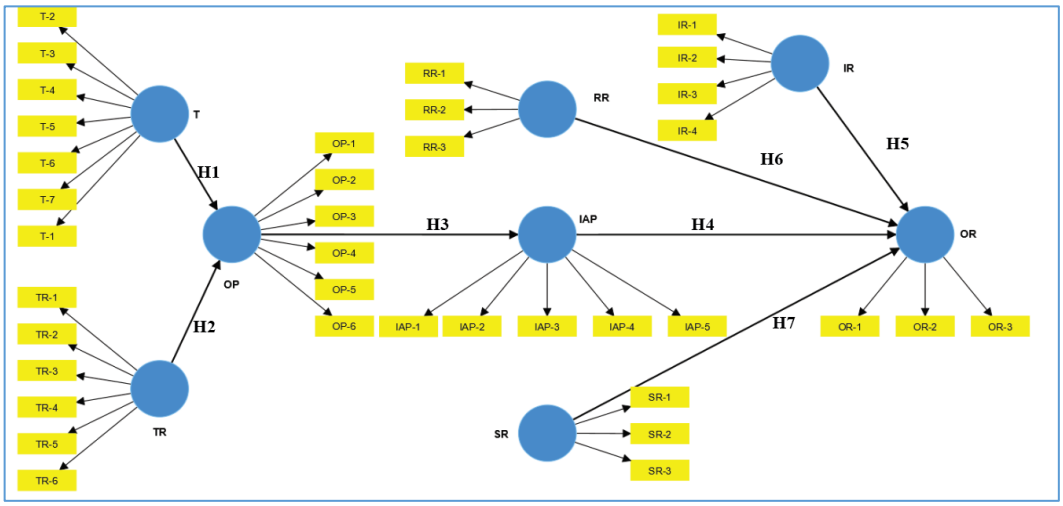
3.1 Hypothesis

This study aims to investigate the main factors affecting the Palestinian local market's adoption of extended reality technology. There are many constructs in research that affect organizational adoption. Based on the literature, four constructs were chosen, which are: innovation readiness, resource readiness, strategic readiness, and academic-industrial partnerships, with a focus on this variable to achieve the goals of the thesis. Based on the literature, one of the most important things affecting the academic-industrial partnership is organizational performance. Also, after researching the literature, it was found that what affects organizational performance is training, in addition to trainees or employees.

So based on existing knowledge, conducting a literature review, and considering the specific context of the Palestinian local market, this research formulates the proposed model of readiness of the Palestinian local market to adapt to extended reality technology, as illustrated in Figure 3.1.

Figure 3.1

Model of Readiness of the Palestinian Local Market to Adapt to Extended Reality Technology



Based on the proposed model, which includes eight variables and 37 indicators taken from the previous literature, the following hypotheses were formulated:

H1: There is no statistically significant positive effect of trainees on organizational performance.

H2: There is no statistically significant effect of training on organizational performance.

H3: There is no statistically significant association between organizational performance and the existence of an industrial-academic partnership.

H4: There is no statistically significant effect of an industrial-academic partnership on the organization's readiness to adapt.

H5: There is no statistically significant effect of innovation readiness on the organization's readiness to adapt.

H6: There is no statistically significant effect of resource readiness on the organization's readiness to adapt.

H7: There is no statistically significant effect of strategic readiness on the organization's readiness to adapt.

3.2 Research Methodology Approach

Research will use both quantitative and qualitative data to find out if the Palestinian market is ready to adopt extended reality (XR) technology through academic-industrial partnerships. The mixed approach will include both questionnaires and interviews. This will help the researcher answer the research questions accurately and gain a better understanding of the model's variables and relationships.

3.2.1 Quantitative Approach

The quantitative approach involves the systematic collection and analysis of numerical data to examine the relationships between variables and test the proposed hypotheses, thus finding out whether the local Palestinian market is ready for extended reality (XR) technology through a partnership between the academic and industrial sectors.

The first step in creating the questionnaire was to select a sample of participants from the local Palestinian market. Therefore, the researcher made the sample diverse and representative of various industries and academic institutions in Palestine.

A comprehensive questionnaire was designed based on the variables previously described in the proposed model. The questionnaire consists of many types of questions, such as closed questions, multiple-choice questions, open questions, binary questions such as yes and no, and Likert scale items. Closed questions collect demographic information, while Likert scale items will assess respondents' perceptions, attitudes, and levels of agreement on a numerical scale (Appendix A).

The questionnaire covers many aspects, such as general information about the institutions and whether they have previous experience with extended reality technology, their readiness to make industrial academic partnerships, organizational performance indicators, and various other dimensions such as innovation readiness, strategic readiness, and resource readiness.

3.2.2 Qualitative Approach

A qualitative approach involves a systematic and in-depth exploration of participants' perspectives, experiences, and opinions for a deeper understanding of the research topic. To find out how ready the Palestinian local market is for extended reality (XR) technology through an academic-industrial partnership, the qualitative approach will focus on interviews with key stakeholders and focus groups.

Key stakeholders, such as representatives from academic institutions, industry leaders, policymakers, technology providers, and local businesses, will be intentionally selected for interviews. These individuals must have a significant role or experience related to XR technology adoption, industry-academic partnerships, or organizational readiness.

Interviews will be developed so that interview questions are consistent while allowing flexibility for open and exploratory discussions. Interview questions will be based on the research goals and variables described in the proposed model, including industrial-academic partnerships, readiness to adopt XR technology, and factors affecting organizational adaptation.

Interview questions will be designed to elicit detailed answers, explore participants' views and experiences, and find out the differences between companies in adopting XR technology and academic-industrial collaboration in the Palestinian local market.

Based on the multiple objectives of the research, the interviews will be with many stakeholders, and to achieve each objective of the research, it was necessary to conduct interviews with different people, such as representatives from academic institutions and industries, educators, administrators, and students; leaders, managers, and employees; conduct focus group discussions or interviews with members of the community to assess their awareness and understanding of XR technology; and conduct interviews with businesses, consumers, and relevant stakeholders to identify barriers hindering XR adoption.

The qualitative approach allows for a more holistic understanding of the complexities surrounding XR technology adoption in Palestine and can help inform policymakers, educators, industry leaders, and other stakeholders to promote the successful integration of XR technology in various sectors.

3.3 The model operationalization

The purpose of using an operationalization model is to translate summary theoretical ideas into measurable and observable variables, or signs. In essence, it includes defining and specifying a way to quantify a concept or assemble it so that it can be empirically tested or analyzed.

The use of an operationalization version is important to make sure that studies are rigorous, replicable, and present meaningful insights into the relationships between variables. It is a vital step in the research procedure that bridges the space between theoretical principles and empirical observations. Appendix B shows the operationalization model.

3.4 Population of the study

A stratified purposive sample was chosen in this research, as the focus was on the decision-making group in Palestinian institutions. The study population includes all types of companies and industries that work in the Palestinian local market. It also includes academic institutions, like universities, colleges, and research centres, that work on research and development related to extended reality technology or take part in academic-industrial partnerships. There are 12,2057 operating institutions in Palestine until 2023, of which 13.1% are industrial activities and 27.2% are service activities, according to the Palestinian Central Bureau of Statistics (2024) in Palestine.

3.5 Sample size

For the proposed model, there were four exogenous variables, which are industrial academic partnership, innovation readiness, strategic readiness, and resource readiness, to explain organizations' readiness to adapt. And according to the sample size recommendation in PLS-SEM for a statistical power of 80%, as shown in Table 3.1, we need 65 observations at a significance level of 5% and a minimum R^2 of at least 0.25. Due to the small sample size, Bootstrapping tests were used by taking 5000 subsamples to verify the validity and reliability of the measurement model.

Table 3.1

Sample size recommendation in PLS-SEM for a statistical power of 80%

Number of Independent Variables	Significance Level 5% Minimum R^2			
	0.10	0.25	0.50	0.75
2	110	52	33	26
3	124	59	38	30
4	137	65	42	33
5	147	70	45	36
6	157	75	48	39
7	166	80	51	41

Source: Hair Junior et al., 2014

3.6 Data collection

The data collection for this research will involve various methods:

1. Questionnaire: The researcher developed a structured questionnaire to collect quantitative data from several participants to examine the readiness of the Palestinian industries to adapt to an extended reality of technology. In addition, the researcher used Likert-scale questions to measure the attitudes and perceptions of the respondents towards XR technology and academic-industrial partnerships.
2. Interviews: The researcher talked in-depth with people from industries, academic institutions, and consumers to reach a number of goals, such as showing how the partnership between academia and industry can help Palestinian institutions adapt to the technology of extended reality, finding out how important it is for educational institutions in Palestine to use extended reality, and figuring out how important it is for consumers to use Determine what the Palestinian local market has in terms of technological resources and infrastructure needed to support XR technology, identify barriers to XR adoption by businesses and consumers, and identify how to overcome these barriers. where Interviews provided valuable qualitative data and allowed researchers to explore challenges and expectations regarding XR technology adoption.

3.7 Data Analysis

The researcher used the Smart PLS programme version 4 to analyse the quantitative data because it is suitable for small sample sizes and easy to use, like shown in Table 3.1, compared with other software like AMOS and Mplus, which need at least 200 samples. Smart PLS also utilises bootstrap resampling to assess the significance of the relationships between constructs, thus providing more accurate results, especially with smaller sample sizes.

The researcher imported the data from the questionnaire responses into SMART PLS and ensured that the data were structured appropriately and that each question was assigned to a corresponding construct.

The researcher then built the measurement model by assigning reflective indicators to constructs. After this, for each reflective construct, the researcher checked the loadings, Cronbach's alpha, and Average Variance Extracted (AVE) to assess the reliability and

validity of the indicators. Then researcher removed any indicators with low loadings or inadequate validity.

Also, the researcher analyzed the interview questions manually. Although there are qualitative analysis programs such as MAX QDA, this is faster and allows for a deeper exploration of the participant's perspectives and experiences, providing rich insights.

The researcher used a mixed-methods approach because it will help provide a more comprehensive view of readiness of the Palestinian local market to adapt to the extended reality technology via academic-industrial partnership.

Chapter Four
Research Results and Analysis

4.1 Descriptive Statistics

Descriptive statistics summarize and describe the main features of a data set, allowing all of its characteristics to be identified. These statistics help researchers understand the principal components, variables, distributions, and basic patterns of the data

4.1.1 Descriptive statistics for questioner respondents

After developing the questionnaire and sending it via email to numerous Palestinian institutions in Palestine, which encompassed the majority of the operational sectors, the response rate was surprisingly low, barely surpassing 15%. That is, during the research, more than five hundred questionnaires were distributed to obtain a sufficient number of responses as required in Table 3.1, and sometimes researcher communicated with some of these sectors directly. The researcher received 80 responses, and the results are displayed as follows in Tables 4.1 and 4.2.

45% (n = 36) of the responses were from the southern cities in Palestine, 38.7% (n = 31) from the central cities, and 16.3% (n = 13) from the northern cities. The establishments whose ages in the labor market ranged from 0 to 5 years amounted to 27.5% (n = 22), the establishments whose ages ranged from 6 to 10 years were 15% (n = 12), and the establishments whose ages ranged from 11 to 20 years were 25% (n = 20), while the establishments that were older than 20 years were 32.5% (n = 26). As for the income of institutions, the institutions whose income is less than 20,000 JD constituted 28.75% (n = 23) of the institutions, and the institutions whose income ranged between 20,000 and 100,000 amounted to 12.5% (n = 10), while the institutions whose income ranged between 100,000 and 200,000 dinars were 13.75% (n = 11). The percentage of companies whose income ranges from 200,000 to 1,000,000 was 7.5% (n = 6), while many companies preferred not to answer this question, which amounted to 37.5% (n = 30). The questionnaire is filled out by a variety of institutions. Industrial facilities are present in 8.8% (n = 7) of the institutes. The largest portion is made up of educational institutions, with 20 institutions representing 25% of the institutes and 17 engineering firms representing about 21.2%. Medical facilities represented 3.7% (n = 3) of all the instances. Also, Professional craft businesses represent 15% (n = 12) of instances, associations

account for 6.3% (n = 5), service institutions represent 5% (n = 4), and there are four commercial corporations, which together make up about 5% of the institutions. A total of three software companies represents about 3.75% of the institutes. In the entire sample, there is only one instance of a governmental institution present (1.25%). A single agricultural business exists, making up about 1.25% of the total. There is only one instance, 1.25% of the total, that is associated with the printing sector. A research and study institute only appears once in 1.25% of all instances. and one chamber of commerce and industry contributes about 1.25 percent of the total.

A number of questions related to the academic-industrial partnership and the use of extended reality technology in the institutions have been added to the questionnaire. When asked whether they have an academic-industrial partnership, 60% answered yes and 40% answered no. When asked whether you have used extended reality before, 21.3% (n = 17) answered yes, and 78.7% (n = 63) said no. Later, a number of links from YouTube were added to the questionnaire (Appendix C). When they were asked if they were interested in extended reality technology after watching the videos, 76.25% (n = 61) of them responded yes, and 23.75% (n = 19) said no. Also, 48.75% (n = 39) of the institutions have expressed their desire to establish an academic-industrial partnership, and 51.25% (n = 41) of the institutions have not expressed their desire.

This percentage (48.75%) is relatively small if compared with more developed countries. According to the Association of American Universities, 90% of American universities have at least one program of cooperation with industry. In a survey of Research Professionals for 2022 in Britain, 72% of British universities have active partnerships with industry. If you compare this percentage globally or in the Arab region, this percentage is excellent, as in a 2020 World Bank study, it was found that the average percentage of industrial academic partnerships in Arab countries is 6%, compared to a global average of 12%. At the Palestinian level, this percentage indicates progress in the work of industrial academic partnerships, as in a survey conducted by the Business Development Centre at Birzeit University in 2018 found that 36% of Palestinian companies have partnerships with educational institutions.

Table 4.1 on the next page contains a summary of the descriptive results for the institutions to which the questionnaire was distributed.

Table 4.1

Descriptive results part 1

Item	Group	Respondents	Percentage %
Age 5	0-5 Years	22	27.50%
	6-10 Years	12	15%
	11-20 Years	20	25%
	More Than 20 Years	26	32.50%
	Total	80	100%
Location	Northern Cities	13	16.30%
	Central Cities	31	38.70%
	Southern Cities	36	45%
	Total	80	100%
Income	0-20,000	23	28.75%
	20,001-100,000	10	12.50%
	100,001-200,000	11	13.75%
	200,001-1,000,000	6	7.50%
	People Preferred Not to Answer.	30	37.50%
	Total	80	100%
Type	Industrial Facility	7	8.80%
	Educational Institution	20	25%
	Engineering Companies	17	21.20%
	Medical Facility	3	3.70%
	Professional Craft	12	15%
	Association	5	6.30%
	Service Institution	4	5%
	Commercial Corporation	4	5%
	Software Company	3	3.75%
	Governmental Institution	1	1.25%
	Agricultural Company	1	1.25%
	Printing Industry	1	1.25%
	Research And Studies Institute	1	1.25%
	Chamber Of Commerce and Industry	1	1.25%
	Total	80	100%

In Table 4.2, there are questions about organizations' use of extended reality and about academic-industrial partnerships that would enhance the research results, in addition to interview questions.

Table 4.2

Descriptive results part 2

	Responses	Number of respondents	Percentage %
Institutions that have partnerships with the academic sector	Yes	48	60%
	No	32	40%
Institutions used extended reality	Yes	17	21.30%
	No	63	78.70%
Institutions that showed interest in extended reality after getting acquainted with this technology (Appendix C)	Yes	61	76.25%
	No	19	23.75%
The desire to make an academic-industrial partnership	Yes	39	48.75%
	No	41	51.25%

4.2 Assessment of Measurement Model

Based on Hair Jr. et al. 's (2021) validation guidelines, when evaluating a measurement model using PLS-SEM, one must focus on internal consistency, convergent validity, and discriminant validity to compare the theoretical measurement with the actual model, which means determining how well the theory fits with the data.

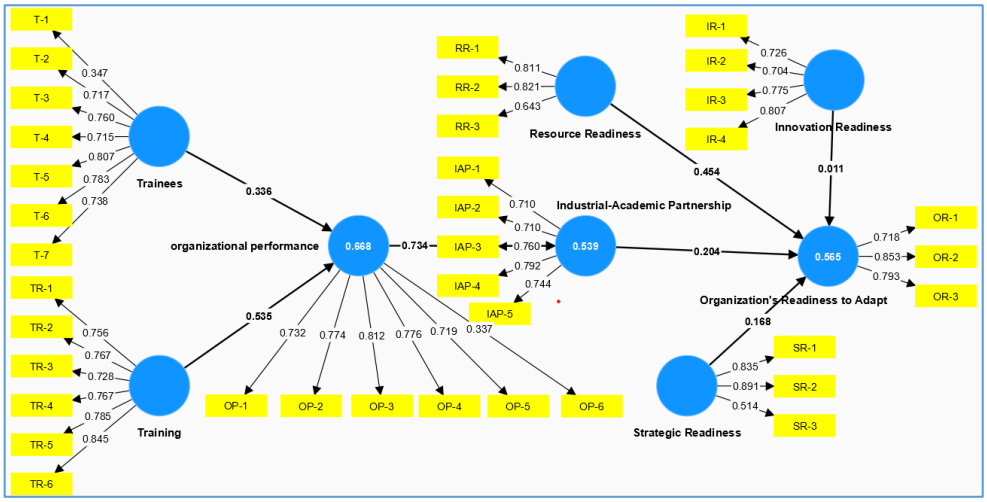
Before evaluating the management model, it is necessary to determine if the construct of the proposed model is reflective or formative. As shown in Fig. 3.1, all constructs in the proposed model were reflective, which helps consolidate knowledge in extended reality and makes it more meaningful and applicable.

4.2.1 Internal Consistency Reliability

The measurement model concentrates on assessing the strength of the relationship between the latent variables and the indicators used for their evaluation. External loadings measure this, and their value must be greater than 0.7 as shown in Fig. 4.1.

Figure 4.1

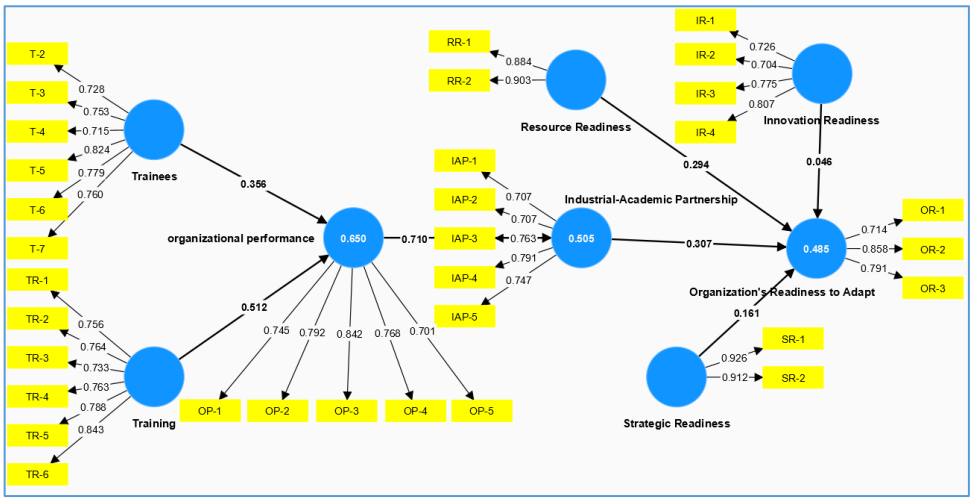
Preliminary Results from The Model Analysis



A factor load that is less than 0.40 needs to be immediately eliminated from the model Hair Jr et al., (2021) so T-1 and OP-6 indicators were removed from the model as shown in Fig. 4.2.

Figure 4.2

The Model Result After Eliminating Some Indicators



To determine internal consistency and reliability for the proposed model, Cronbach's alpha values are considered in general, but it suggests that the scale's indicators are all

equally weighted and Cronbach's alpha depend on the total number of indicators used in the construct, so it is considered conservative (Hair Jr et al., 2021).

To avoid this limitation, we will examine composite reliability (CR) values, which is a different internal consistency reliability measure that account for the various outer loadings of the indicator and provides more accurate reliability estimates than Cronbach's alpha (Henseler et al., 2009). However, in this research, we will take Cronbach's alpha and composite reliability values because these are more reasonable.

The reliability indicator should be taken into consideration before attempting to determine the internal consistency and reliability of the PLS structural equation model through the evaluation of Cronbach's alpha and CR results.

Cronbach's alpha values are desired to be between 0.7 and 0.9 (Urbach & Ahlemann, 2010), and the average variance extracted (AVE) value is desired to be greater than 0.5 (Bagozzi & Yi, 1988). If any of the factors affect the composite reliability (Cronbach's alpha, average variance extracted), its range of 0.40 and 0.70 should be removed, so that RR-3 and SR-3 are removed because they affect Cronbach's alpha and AVE as shown in Fig. 4.2.

4.2.2 Convergent validity (AVE and Individual indicator reliability)

The degree to which a measure exhibits a favorable correlation with additional measures of the same construct is referred to as convergent validity (Hair Jr et al., 2021). To assess the presence of convergent validity, the examination of individual indicator reliability (outer loadings), which was mentioned previously, and average variance extracted (AVE) values is undertaken, whose values must be greater than 0.5 as shown in Table 4.3.

Table 4.3

Cronbach's alpha, composite reliability (CR) and average variance extracted

	Cronbach's alpha	Composite reliability	Average variance extracted
Industrial Academic Partnership	0.798	0.802	0.553
Innovation Readiness	0.753	0.770	0.569
Organizational Performance	0.829	0.836	0.594
Organizations readiness to adapt	0.699	0.725	0.624
Resource Readiness	0.749	0.753	0.799
Strategic readiness	0.816	0.820	0.844
Trainees	0.867	0.871	0.601
Training	0.854	0.855	0.579

These measures helped the researcher ensure the strength and accuracy of the measurements, which will ultimately support the validity and credibility of the research results.

4.2.3 Discriminant validity

Each construct in the model must be substantively distinct from all others in order to satisfy the discriminant validity requirement. Therefore, it must be taken into consideration that a phenomenon that is measured by a specific construct shouldn't be measured by another construct (Hair Jr et al., 2021).

There are many approaches for measuring discriminant validity; one of the most common is the Fornell-Larcker criterion; there is a cross-loading approach; and there is a new approach, which is the heterotrait-monotrait ratio (HTMT).

In Fornell-Larcker criterion the variance between a construct and its indicators must be greater than the variance between the same indicators and any other construct in the model (Urbach & Ahlemann, 2010). So, the diagonal factors (bold) in Table 4.4, which represent the square root of AVE for each construct, showed that the desired outcome was achieved. Diagonal factors also indicate that the variance between the construct and its indicators is greater than the rest of the constructs.

Table 4.4

Fornell-Larcker Criterion results

	IAP	IR	OP	OR	RR	SR	T	TR
IAP	0.744							
IR	0.475	0.754						
OP	0.710	0.368	0.771					
OR	0.615	0.431	0.457	0.790				
RR	0.634	0.519	0.510	0.624	0.894			
SR	0.620	0.542	0.604	0.479	0.691	0.919		
T	0.687	0.474	0.767	0.381	0.521	0.642	0.755	
TR	0.566	0.458	0.723	0.342	0.392	0.596	0.718	0.716

In addition to the Fornell-Larcker criterion, the heterotrait-monotrait ratio (HTMT) is also a common method to assess discriminant validity and can eliminate deficiencies in the Fornell-Larcker criterion because the sensitivity of the Fornell-Larcker criterion is 20.82%, but HTMT is 97% to 99% (Ab Hamid et al., 2017).

'The HTMT is an estimate for the factor correlation (more precisely, an upper boundary), (Henseler et al., 2016) the value of HTMT must be less than 0.85 (Bowen & Guo, 2011) or less than 0.90 (Ab Hamid et al., 2017) So Table 4.5 indicates there is discriminant validity.a

Table 4.5

HTMT results

	IAP	IR	OP	OR	RR	SR	T	TR
IAP	1							
IR	0.636	1						
OP	0.867	0.475	1					
OR	0.821	0.571	0.627	1				
RR	0.823	0.699	0.652	0.840	1			
SR	0.773	0.694	0.729	0.738	0.882	1		
T	0.831	0.605	0.891	0.496	0.651	0.711	1	
TR	0.692	0.584	0.845	0.441	0.485	0.711	0.833	1

The results for the HTMT values in the table are low (less than 0.85), except for one value (0.867), which is consistent with Ab Hamid et al. (2017), which indicates that the constructs are sufficiently different from each other, so these results strengthen the validity of the measurement model.

4.3 Assessment of Structural Model

After confirming the measurement model in the preceding section, we will evaluate the structural model in this section by assessing the structural model for collinearity issues, then showing the significance and relevance of the structural model relationships, assessing the level of R^2, and assisting in determining the f^2 effect size (Hair Jr et al., 2021).

4.3.1 Assessing structural model for collinearity issues

To assess collinearity issues in the structural model, we will measure the variance inflation factor to detect multiple linearity problems. The inner variance inflation factor must be less than 5 to ensure that there are no collinearity problems (Hair Jr et al., 2021), so there are no collinearity problems in the model, as shown in Table 4.6.

Table 4.6

Inner -VIF values

	IAP	IR	OP	OR
IAP				1.908
IR				1.529
OP	1.000			
RR				2.275
SR				2.276
T			2.065	
TR			2.065	

4.3.2 Assessing significance and relevance of the structural model relationships

This step will test the hypotheses about the relationship between constructs by using the path coefficient test (β value), which is used to indicate the strength of the relationship between two constructs. The magnitude of the path coefficient will be +1 to -1. The relationship becomes stronger as the value approaches +1, and the relationship becomes

weaker as it approaches -1. In both cases, the relationship is significant, but if it is close to 0, the relationship is statistically weak and not significant (Hair Jr et al., 2021).

The empirical t value will be statistically significant if it is greater than the critical value (corresponding to 1.96 in two-tailed tests). P values were also calculated to determine the significance level (a p-value of 0.05 or lower is considered statistically significant).

After bootstrapping the procedure using Smart PLS, 5000 subsamples were identified, and a significance level of 0.05 was determined. Figure 4.3 shows the results of bootstrapping the model with associated t values and Table 4.7 shows hypotheses tested (Direct effect) outcomes.

Figure 4.3

The Model Results

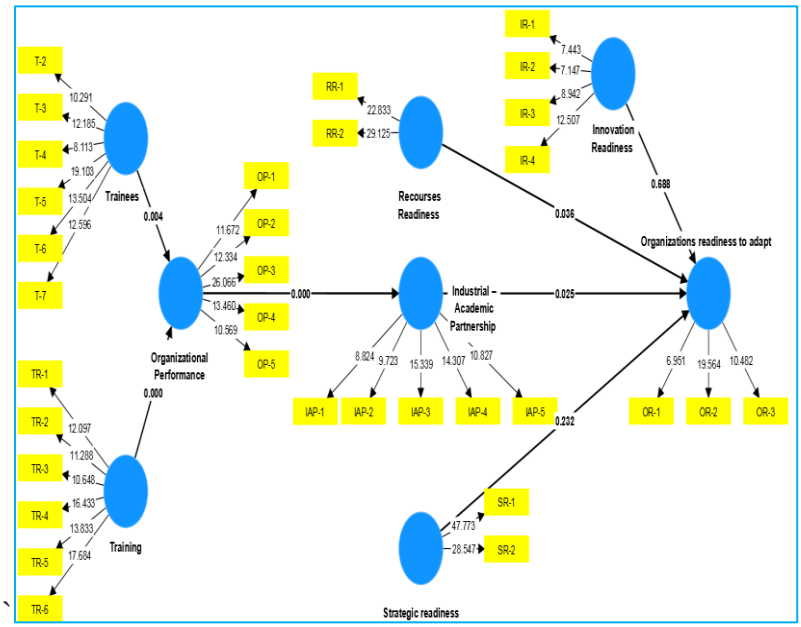


Table 4.7

Model path coefficients

Paths	Sample Mean (M)	Standard Deviation (STDEV)	Path Coefficients (β)	t Values	p Values	95% Confidence Intervals	Significance (p < 0.05)?
IAP=> OR	0.304	0.137	0.307	2.237	0.025	[0.034,0.573]	Yes
IR => OR	0.053	0.114	0.046	0.402	0.688	[-0.186,0.262]	No
OP=> IAP	0.719	0.052	0.710	13.634	0.000	[0.608,0.813]	Yes
RR=> OR	0.305	0.140	0.294	2.096	0.036	[0.033,0.587]	Yes
SR => OR	0.160	0.135	0.161	1.195	0.232	[-0.144,0.420]	No
T => OP	0.514	0.097	0.512	5.254	0.000	[0.310,0.694]	Yes
TR => OP	0.364	0.125	0.356	2.845	0.004	[0.114,0.606]	Yes

The table shows a high-significance relationship between industrial-academic partnership and organization readiness to adapt (β = 0.307, t = 2.237, and p-value 0.025), while the relationship between innovation readiness and organization readiness to adapt is not significant (β = 0.046, t = 0.402, and p-value 0.688). Also, the relationship between organizational performance and industrial-academic partnerships is significant (β= 0.710, t value = 13.634, and p-value 0.000), and the relationship between resource readiness and the relationship between them is significant (β= 0.294, t value = 2.069, and p-value 0.036), while the relationship between strategic readiness and organizational performance is not significant (β= 0.161, t value = 1.195, and p-value 0.232), and the relationship between training and organizational performance is significant (β= 0.512, t value = 5.254, and p-value 0.000) and the relationship between trainees and organizational performance is significant (β = 0.356, t = 2.845, and p-value 0.004).

4.3.3 Assessing the level of R^2 (Coefficient of Determination)

Coefficient of determination R^2 measures the amount of variance in the dependent variable that the independent variables can predict; it is crucial for determining the structural model's predictive ability (Urbach & Ahlemann, 2010).

Coefficient of determination take values from 0 to 1; if the value is close to 1, this means high predictive power so the path coefficient has different thresholds, but in this study, it will be according to Hair, so if the dependent constructs R^2 have values of 0.25, 0.50, and 0.75, they are classified as *weak, moderate, and substantial, respectively* (Hair Jr et al., 2021); Table 4.8 shows the results of the coefficient of determination.

Table 4.8

The level of R^2

	R-square	R-adjusted
IAP	0.505	0.498
OP	0.650	0.640
OR	0.485	0.458

Therefore, as shown, the three dependent variables, which are industrial academic partnership, organizational performance, and organizational readiness to adapt, have a moderate effect.

4.3.4 Assess the level of f^2

F squared is used to determine if there is a significant impact on the dependent variable by removing an independent variable from the model. According to Cohen, if the independent variables' f^2 have values of 0.02, 0.15, and 0.35, they represent *small, medium, and large* effects, respectively, Table 4.9 shows f^2 results.

Table 4.9

f square (f^2)

	IAP	OP	OR
IAP			0.096
IR			0.003
OP	1.019		
RR			0.074
SR			0.022
T		0.362	
TR		0.175	

Therefore, as shown in the table, the industrial-academic partnership (0.096), resource readiness (0.074), and strategic readiness (0.022) have a small effect size on organizations readiness to adapt, but innovation doesn't have an effect (0.003), and there is a large effect size on organization performance (1.019) in the industrial-academic partnership. Also, training (0.362) has a large effect size on organizational performance, and trainees (0.175) have a medium effect size on organizational performance.

4.4 Qualitative results

Interviews were conducted with a number of industrial establishments in Palestine and a number of companies with different specialties, in addition to school managers and teachers. Interviews were also conducted with a business incubator and a number of medical institutions; the number of these institutions exceeded 20. These institutions did not include the institutions that filled out the questionnaire. It should be noted that some of the institutions interviewed were introduced to the extended reality technique before the interview was conducted. Interview questions and interviewee answers are listed in Appendix D. The names of these institutions and their locations have been added in Appendix E.

First Question: How important is virtual reality to you?

A wide range of industries perceive extended reality as a valuable tool, with potential applications in prototyping, training, design visualization, education, tourism, and healthcare. While some respondents expressed reservations due to the specific nature of

their work, the general consensus leans towards XR being a significant asset with the potential to enhance operations, customer experiences, and educational outcomes.

This interview allows us to classify the importance of extended reality into several categories based on the fields in which this technology is used, as follows:

1- Manufacturing

The manufacturing sector paid attention to:

Cost reduction and accuracy in prototyping: The manufacturing sector has shown interest in extended reality technology due to its ability to reduce production costs and improve prototype accuracy. Manufacturer 1 stated that virtual reality is crucial for us because it will help us prototype products at a lower cost than usual.

Training Improvement: The primary goal of manufacturing institutions in Palestine is to enhance training, as it plays a crucial role in their development and in raising the quality of their products. As Manufacturer 2 stated, "If I use virtual reality in the factory, I will only use it in the field of training," and Manufacturer 1 added, "And it will improve training processes."

2- Engineering (Architecture)

Enhanced customer experience: the primary goal the architecture sector seeks most is to improve the customer experience, which in turn will increase the sales of these institutions, such as engineering companies (architecture), which say virtual reality allows customers to immerse themselves in the design, unlike traditional design, so consumers can see the details of the building and view it in 360 degrees.

3- Engineering (Mechanical and Electrical)

Enhanced modelling and training: Improving building modelling is crucial for mechanical and electrical engineering because it reduces implementation errors. Additionally, training employees improves production quality. Engineering company (Mechanical & Electrical) 4 said: We usually use simulation programs to model electromechanical works, so the use of virtual reality will constitute a quantum leap in modelling electromechanical works for us, and it will also help improve the performance of new trainees. Interviewee 5 (same category) acknowledges XR's value in training but finds it applicable to their specific design and supervision tasks.

4- Tourism

Enhanced Tourist Experience: Tourism companies have shown significant interest in extended reality technology due to its ability to display and promote tourist places in an interactive and attractive manner, thereby enhancing the tourist experience. According to Tourism Company 1, virtual reality offers an excellent experience for tourists, enabling them to visit new sites in a unique manner.

5- Education

Improved learning outcomes: The educational sector encourages extended reality technology because it makes it easier for students to learn and receive information, which improves learning outcomes. School Manager 1 confirmed this and said virtual reality opens new horizons for students and teachers, as it helps in understanding information better, and it is also a helpful factor for teachers to diversify learning methods.

Tangible teacher-student interaction: The educational sector has observed that the use of extended reality technology enhances students' interaction with teachers. School Director 2 stated, "Virtual reality is an attractive world commensurate with technological reality, and through it, there will be tangible interaction between teachers and students."

6- Business Incubation

Streamlined entrepreneurial support: The use of extended reality technology in business incubators helps to develop the trainees' capabilities, in addition to supporting them in making prototypes for their projects. Business incubators say that through virtual reality, it is possible to track entrepreneurs and provide their basic training needs at the idea owner's location.

7- Healthcare

Training, education, and rehabilitation applications: Extended reality technology helps students develop their abilities by providing interactive training and rehabilitation. Medical institution 2 says: Virtual reality will help us in our rehabilitation programs by providing patients with interactive treatment experiences.

Surgical Planning: Extended reality technology helps diagnose medical conditions and make surgical plans better, according to Medical Institution 3: Through virtual

reality, we can move around the human body easily, so we can perform surgeries virtually before entering the operating room.

Second question: What are the concerns or obstacles to using the extended reality technology in your institution?

The interviewees identified many obstacles to the use of extended reality technology, which they distilled into four fundamental challenges:

1. **Financial Constraints**

   High initial costs: Most of the institutions interviewed said that the initial cost is the biggest obstacle to using this technology, such as Manufacturer 1 and Engineering Company (Architecture).

   Ongoing costs: Several institutions have identified ongoing costs as a significant concern, as they must constantly update their data due to the nature of their work. For instance, Tourism Company 1 has expressed the need to create content for various locations.

2. **Technological Challenges**

   Software incompatibility: One of the technological challenges was ensuring compatibility between CAD programs and extended reality programs, such as those used in engineering companies (architecture). This highlighted the need for integration between VR software and the software used in design and engineering companies (Mechanical & Electrical).

   Content creation difficulties: There were obstacles resulting from difficulties in manufacturing content, such as Manufacturer 2, who said: The main obstacle is creating training content that suits our manufacturing processes, and Engineering Company (Mechanical & Electrical) 4 that said**:** Developing high-quality content using virtual reality may take a long time.

   Hardware limitations: Another technological obstacle is the lack of virtual reality devices, which has affected secondary education in schools.

3. **Human factors**

Lack of expertise: The human factor significantly impedes the use of extended reality technology. According to an engineering company specializing in architectural and civil engineering, training is essential for engineers to effectively utilize virtual reality hardware and software, as well as to understand the building process. Medical institutions confirmed the lack of knowledge of doctors in dealing with virtual reality technology, and institutions need resources and expertise.

Resistance to change: Some organizations, such as Manufacturer 3, have confirmed that their employees do not accept dealing with new technology. Similarly, Engineering Company (Architecture & Civil) 3 employees, who are accustomed to traditional design, have shown that they are hindered from using extended reality technology.

User experience issues: There were also obstacles related to user experience problems, as one of the teachers said: The student may not be able to connect virtual reality technology to the educational material.

4. **Strategic and operational challenges**

Lack of planning and integration: There are strategic obstacles that prevent the use of extended reality technology related to the lack of planning and integration in institutions, and this was confirmed by the business incubator, where it said: Many obstacles include the lack of strategic planning in some companies and the failure to form partnerships.

Ineffective educational materials**:** Among the obstacles that also exist are obstacles related to operational challenges, as there was a lack of content and materials, as one of the teachers emphasized: the lack of educational materials that match virtual reality with the required material.

Third Question: What do we want XR technology to change in the learning process?

There is a strong consensus on the ability of XR to enhance learning experiences and develop practical skills; therefore, the interviewees expressed their interest in changing the educational process through extended reality technology, including three changes:

1- Enhancing Learning Experience

Immersive and interactive learning: Respondents emphasize XR's potential to create engaging and interactive learning environments, allowing learners to explore concepts in depth and from different perspectives. Engineering company (architecture & civil) 3 say in the learning process, we hope that VR will make it easier for engineers to analyze and experiment with complex structures.

Practical skills development: A strong focus on developing practical skills through simulation and real-world scenarios is evident. People view XR as a tool that bridges the gap between theory and practice. According to Medical Institution 2, XR simulates surgeries, rendering them highly realistic.

Knowledge Expansion: Respondents highlight the potential of XR to broaden learners' horizons and expose them to new information and perspectives. Teacher 4 says facilitating access to information and enhancing students' acceptance of education are key objectives.

2- Improving Efficiency and Collaboration

Streamlined Processes: It is anticipated that XR will streamline workflows and promote collaboration between learners and experts. Manufacturer 3 says it will assist workers in interacting with new machines.

Problem Solving and Innovation: Respondents believe XR can foster creative thinking and problem-solving abilities. Business incubators say they are preparing for the challenges and opportunities they will face as they grow their businesses.

3- Transforming Healthcare Education

Medical Training and Simulation: The healthcare sector recognizes the significant potential of XR in enhancing medical education, training, and patient care through realistic simulations. All medical institutions visited confirmed this.

Fourth question: Is there a tendency to create partnerships with the academic or industrial sectors? why?

Institutions differed in their interest in forming academic-industrial partnerships, and we can categorize these institutions into the following groups:

1- Existing Partnerships and Collaboration

Active Partnerships: These institutions have established partnerships with the academic and industrial sectors, and these companies are based on cooperation between these institutions, such as Business Incubator.

Limited or no partnerships: These institutions do not have partnerships with the academic or industrial sectors, but they have expressed their interest and openness to future cooperation, such as Tourism Company 1, School Manager 1, Medical Institution 1, 2.

2- Motivations for Partnerships

Access to Knowledge and Resources: These organizations seek partnerships to access new technologies, expertise, and resources, such as tourism company 1, business incubator, and medical institution 3.

Talent Development: The focus of these organizations is on developing talent and keeping up with modern industry trends through partnerships such as School Manager 2, Teacher 1, 2, 3, and 4.

Market Relevance: These institutions prioritize maintaining relationships with the academic and industrial sectors, as it is crucial for them to stay connected to the local Palestinian market. Examples of these institutions include Teacher 3, 4, and business incubators.

3- Industry-Specific Considerations

Healthcare and Academia: Healthcare institutions emphasize the importance of partnerships with academic institutions because they help them in research, education, and knowledge exchange, such as medical institutions.

Fifth Question: How can academic-industrial partnerships contribute to the adaptation of Palestinian institutions to extended reality technology?

Palestinian institutions have demonstrated many ways of adapting these institutions to extended reality technology. These methods can be classified into several categories, including:

1- Human Capital Development

Skill Enhancement: According to the majority of institutions, academic-industrial partnerships offer numerous training opportunities and contribute to the professional development of professionals across various sectors. These institutions include manufacturers 1, 2, engineering companies 1, 2, 3, 4, 5, tourism companies 1, school managers 1, 2, teachers 1, 2, 3, and medical institutions 1, 2.

Talent Pipeline: Collaborations can help create a skilled workforce in the field of XR, as evidenced by what Engineering Company 1 said: Partnering with academic institutions will help us learn how to exploit this technology in architectural design.

2- Knowledge Transfer and Innovation

Research and Development: Academic-industrial partnerships can help in many research and development processes for XR technologies, as many institutions have supported this idea, including Manufacturer 1, Engineering companies 1, 2, 3, 4, Tourism company 1, 2, and Teacher 1.

Technology Transfer: Academic research can be translated into practical applications through industry collaboration, said Manufacturer 1, who also supported this idea. Cooperation with universities can also help in developing virtual reality solutions. Engineering companies 1, 2, and 3; tourism company 1, 2.

3- Industry-Specific Applications

Tailored Solutions: More than half of the institutions, including Manufacturer 1, Engineering companies 1, 2, 3, 4, 5, Tourism companies 1, 2, and medical institutions 1, 2, 3, agree that partnerships can solve unique problems specific to each institution, leading to the development of XR technologies.

Problem-Solving: Collaborative efforts can address specific industry challenges. Engineering companies 2 and 3 confirm this, saying that Partnership will reduce engineers' errors.

4- Educational Enhancement

Curriculum Development: Partnerships can support the development of XR-based educational materials and curricula, as confirmed by school managers 1, 2, teachers 1, 2, 3, and 4.

Pedagogical Innovation: Collaborations can foster new teaching and learning methods using XR technologies, as confirmed by school managers 1, 2, teachers 1, 2, 3, and 4.

5- Economic Development

Job Creation: The use of XR technology in Palestinian institutions will generate many job opportunities, as the Manufacturer 2 says partnership will therefore help create a pool of skilled professionals capable of implementation and using virtual reality technology effectively.

Competitiveness: Partnerships can enhance the competitiveness of Palestinian institutions in the global market. It is important to note that this is the case for Manufacturer 1, Tourism Company 1, and 2.

Sixth question: Tell me if you have the ability to adopt extended reality in your organization and if there are obstacles.

The responses highlight a clear divide between organizations with the capacity to adopt extended reality and those facing significant challenges. While some organizations are prepared to adopt the technology, others face obstacles due to resource constraints and the requirement for training.

1- Ability to Adopt Extended Reality

Ready to Adopt: Organizations possessing the necessary resources and capabilities, such as Manufacturer 1, Manufacturer 2, Engineering Company (Architecture), Engineering Company (Architecture & Civil), and Engineering Company (Mechanical & Electrical). The tourism company ranks first, followed by the medical institution.

Potential to Adopt: Organizations with the intent to adopt but require additional resources or training, such as Manufacturer 3, Tourism Company 2.

No Immediate Plans: Organizations with no current plans for adoption, such as engineering companies (mechanical and electrical), 5.

2- Obstacles to Adoption

Lack of Resources: Organizations confronting financial or technological limitations encompass school managers 1, 2, teachers 1, 2, 3, 4, business incubators, and medical institutions 1, 2.

Human Capital Constraints: Organizations that lack employees have the ability to use extended reality technology, such as Manufacturer 1, 2.

Chapter Five
Discussion and conclusion

This chapter will explain and analyze the results of the study to determine the implications of the results reached and compare them with existing literature, in addition to explaining their importance to this study and providing a concise summary of the key findings.

5.1 Discussion

This section will compare the study results we obtained after analyzing the questionnaires with the existing literature and explain their significance.

H1: There is no statistically significant positive effect of trainees on organizational performance.

After analyzing the data, this hypothesis rejected. It was found that the p value for the relation between trainees and organizational performance is 0.000, which is less than 0.05, which means the relation is statistically significant.

Therefore, the result of this hypothesis is consistent with what (Atmaja et al., 2023) said, as in order to improve organizational performance, attention must be paid to employees (trainees) through several methods, including helping employees identify the skills needed for work, encouraging them to carry out the tasks assigned to them correctly and in a correct manner, and motivating them through rewards.

Due to their beneficial impact on organizations' performance, the researcher recognizes the significance of trainees representing by employees, academics, and craftsmen and others.

H2: There is no statistically significant effect of training on organizational performance.

This hypothesis was rejected, and the results indicate that the relationship between training and organizational performance is statistically significant because the p-value is 0.004, which is less than 0.05.

The research results are consistent with those of many researchers who indicated that the relationship between training and organizational performance is statistically significant, like (Anwar & Abdullah, 2021l; Saeed, 2011).

Training is of great importance because of its major role in developing the performance of organizations. Therefore, it must be given high priority for its role in developing the performance of employees in addition to its role in developing the organization's performance.

H3: There is no statistically significant association between organizational performance and the existence of an industrial-academic partnership.

The research showed that this hypothesis was rejected; the p-value for these hypotheses is 0.000, which is less than 0.05, which means the relationship between organizational performance and industrial academic partnership is statistically significant.

Research has indicated that many organizational factors influence academic-industrial partnerships, such as communication and leadership (Rast et al., 2015). Academic-industrial partnerships also help strengthen bridges between academic science and technology commercialization (S. Chai & Shih, 2016).

This is also supported by the interviews that were conducted in addition to the open questionnaire questions, as many partnerships decided to establish partnerships with the academic and industrial sectors in order to improve the performance of the organization and individuals.

The researcher also sees the necessity of making these partnerships because of their prominent role in reducing the gap between the academic and industrial sectors, which is to develop academic performance in line with the needs of the industrial sector in Palestine.

H4: There is no statistically significant effect of an industrial-academic partnership on the organization's readiness to adapt.

Through analysis of the model, this hypothesis was rejected. It was found that the academic-industrial partnership positively affects the readiness of organizations to adapt, whereas the P-value for these hypotheses is 0.025, which is statistically significant because it is less than 0.05.

According to (Lokuge et al., 2019), partnership readiness positively affects organizational readiness to adapt and innovate with new technology. This indicates that the two studies agree on this part, which confirms the validity of this hypothesis.

What also supports this theory are the answers to one of the questions in the questionnaire, where the answers confirmed that partnerships positively affect organizations' readiness to adapt to extended reality technology, as 58% of those who filled out the questionnaire confirmed that extended reality gives them the knowledge, they need faster. He also confirmed, to the same degree, that extended reality gives them new skills. 55.6% believe that it will improve the performance of workers in the organization. And 40.7% expect that it will help workers integrate into work in a better way. 54.3% believe that extended reality will facilitate the learning process.

In addition to the last two questions in the interview, many institutions and companies confirmed their willingness to adopt extended reality technology, and the importance of the role of the academic-industrial partnership in adapting Palestinian institutions to extended reality technology was also proven.

H5: There is no statistically significant effect of innovation readiness on the organization's readiness to adapt.

In this research, which fails to reject this hypothesis, it was shown that the relationship between organizational readiness to adapt to new technology and innovation readiness is not statistically significant, with a p-value of 0.688, which is larger than 0.05.

It was found in Lokuge & Sedera, (2020) research that the relationship between innovation readiness and organizations' readiness to adapt to new technology was statistically significant.

The researcher expected that innovation readiness would have a positive impact on organizations' readiness to adapt. What was shown in previous research, however, appeared to be the opposite in Palestine, such that there is no need for this readiness in order to adapt to extended reality technology in Palestine.

H6: There is no statistically significant effect of resource readiness on the organization's readiness to adapt.

Through this research, this hypothesis was rejected. It was shown that the relationship between organizational readiness to adapt to new technology and resource readiness is statistically significant, with a p-value of 0.036, which is less than 0.05.

This result is consistent with what (Lokuge et al., 2019)said, as the relationship between organizational readiness to adapt to new technology and resource readiness is statistically significant in both.

Resource readiness is one of the most important factors that affect organizations' readiness to adapt to extended reality technology, as was also proven in the interviews conducted by the researcher, where many organizations confirmed the presence of material obstacles. In addition to the lack of sufficient experience in the field of extended reality

H7: There is no statistically significant effect of strategic readiness on the organization's readiness to adapt.

This research showed that this hypothesis failed to be rejected and that the relationship between organizational readiness to adapt to new technology and strategic readiness is not statistically significant, with a p-value of 0.232, which is bigger than 0.05.

Lokuge et al., 2019) say in research that the relationship between strategic readiness and organizations' readiness to adapt to new technology was statistically significant.

Despite the importance of strategic readiness for all institutions, the local market in Palestine has yet to embrace this hypothesis. The researcher sees this is because of a number of things, which would make it hard for institutions to implement strategic readiness, as well as political instability, which would make the environment unstable, and social and cultural factors like management being spontaneous and not using long-term plans.

5.2 Quantitative conclusion

Based on the objectives that were previously identified and after reviewing the literature, a proposed model was built, and then a questionnaire was created and distributed to many Palestinian institutions, including factories, educational institutions, academic institutions, companies, engineering and tourism offices, and many others. The questionnaire contained two sections of questions.

The first section is related to general information about the institutions that filled out the questionnaire, such as the company's age, type, location, and income, in addition to the work activity of these institutions. There were a number of questions related to industrial academic partnerships and the extent of these companies' knowledge of extended reality technology, in addition to their desire to establish industrial academic partnerships to exploit extended reality technology. Videos were added to the questionnaire, which contains an explanation of the institutions that do not have a good idea about extended reality. The second section of the questionnaire concerns the questions for the proposed model, which aims to study the extent of the readiness of the Palestinian local market to adapt to extended reality technology (virtual reality, augmented reality). The proposed model consists of eight variables: trainees, training, organizational performance, academic-industrial partnership, innovative readiness, resource readiness, strategic readiness, and organizations' readiness to adapt. These variables formed seven hypotheses.

The first and second hypotheses examined the relationship between trainees and organizational performance, training, and organizational performance; both hypotheses were supported, and the third hypothesis was also supported, which examined the relationship between organizational performance and academic-industrial partnership, was also supported. The three variables, which are trainees, training, and organizational performance, are taken in order to support the fourth variable, which is industrial-academic partnership, since the partnership with the academic sector is mainly related to the training process and trainees, which in turn supports organizational performance in organizations. As for the fourth hypothesis, it is the basic hypothesis in this research, which tests the relationship between the academic-industrial partnership and the organizations' readiness to adapt. After analyzing the questionnaire, this hypothesis was supported.

The fifth hypothesis examined the relationship between innovation readiness and the organization's readiness to adapt to extended reality technology, but this hypothesis was not supported, as most of the organizations interviewed later saw that innovation is not an obstacle to adopting this technology. The sixth hypothesis examined the relationship between resource readiness and the organization's readiness to adapt.

This hypothesis was supported, as financial and human resources constitute a major obstacle for Palestinian organizations. As for the seventh hypothesis, it examined the relationship between strategic readiness and the organization's readiness to adapt to extended reality technology, but this hypothesis was not supported, as most Palestinian organizations do not see the necessity of strategic readiness in order to adopt this technology. The researcher believes that one of the reasons for rejecting the hypotheses of fifth and seventh is that most Palestinian companies are family companies, in which the family in turn takes decisions without making strategic plans. Additionally, these institutions or businesses do not seek innovation and do not view it as a barrier because innovation occurs for personal reasons rather than as part of a plan.

Based on the above, we can answer the basic research question in this research, where four factors were taken into account: innovation readiness, resource readiness, academic-industrial partnership, and strategic readiness, to determine their impact on organizations' readiness to adapt to extended reality technology, especially academic-industrial partnership. As a result, it was proven that the Palestinian local market is ready to adapt to extended reality technology and that academic partnership has a major role in this, in addition to financial and human resources.

5.3 Qualitative conclusion

First question: How important is virtual reality to you?

Interviews indicate a generally positive view of the enormous potential of VR across industries. Although its applications vary, there is consensus on its ability to enhance perception, improve efficiency, and provide competitive advantages and this consists with Atmaja et al. (2023), who confirmed that extended reality increases the efficiency of the institution and the individual.

However, the level of enthusiasm and perceived importance varies based on the specific needs and capabilities of each organization. These institutions expressed the importance

of extended reality in enhancing the experiences of employees and trainees in their fields, and 65% of these institutions agreed that extended reality technology increases the profits of institutions and increases their competitiveness. The manufacturing and engineering sectors confirmed that using this technology increases their competitiveness and this consists with (Delgado et al. 2020; Hernández-de-Menéndez et al. 2019) .

Most institutions emphasized the importance of this technology in design and simulation. Despite its importance, some institutions, especially in manufacturing and engineering, expressed reservations about applying this technology due to restrictions that did not benefit their institution. Some institutions also expressed their inability to use this technology due to the lack of the necessary training, which is consistent with the first, second, and fourth hypotheses. Other institutions have shown the lack of sufficient material and human resources, and this is consistent with the sixth hypothesis.

Companies hold varying views on the importance of extended reality, with manufacturers concluding that it has no impact on their manufacturing processes, and this is consistent with survey data that show 76% of companies trust in extended reality technology. Some companies believe that XR may not add value to their current operations, but there is potential for XR training.

Second question: What are the concerns or obstacles to using the extended reality technology in your institution?

In Palestinian institutions, the use of extended reality (XR) technology faces numerous obstacles, such as financial limitations, resource scarcity, training needs, and industry-specific concerns.

Each institution has its own unique reasons for utilizing these resources; more than 50% of these institutions expressed reasons for providing the necessary resources Khandelwal & Upadhyay (2021) confirmed this opinion while the majority expressed motives for providing the necessary training Cooper et al (2021) confirmed this opinion. The industrial sector showed difficulties with compatibility between XR and CAD programs, and approximately 60% of the institutions expressed difficulties with providing content for use in their magazines.

While XR technology has enormous potential, overcoming the obstacles to its adoption, including the availability of material and human resources, is critical, and this result is consistent with the sixth hypothesis of the proposed model.

Third question: What do we want XR technology to change in the learning process?

Manufacturers, engineering companies, tourism companies, teachers, medical institutions, and even business incubators share a common objective in responding to this question: to reap the benefits of XR in the education and training process. This aligns with the findings of the first and second hypotheses, which suggest that training and trainees influence the organizational performance of institutions.

According to the interviews, there was a strong desire to benefit from XR technology because it works to enhance learning experiences by creating more attractive and interactive educational experiences, in addition to providing a better understanding of complex concepts through visual representation. It also works to bridge the gap between theory and practice by providing practical simulations Qiao et al. (2021) confirmed this, and benefiting from extended reality improves skills development by developing practical skills through realistic simulations, enhancing critical thinking and problem-solving abilities, in addition to enabling cooperative learning and teamwork.

Taking advantage of extended reality develops educational processes, helps design education to suit individual needs and learning styles, expands access to teaching and learning resources, and improves efficiency by optimizing learning time and resources.

Fourth question: Is there a tendency to create partnerships with the academic or industrial sectors? why?

There is a strong tendency in the institutions surveyed to establish partnerships with the academic or industrial sector for many reasons, including access to knowledge and new technologies, as collaborations can provide access to the latest research and innovations, in addition to talent acquisition, as collaboration can help institutions identify and recruit skilled talent. Zandkarimi et al. (2020) and interviewers confirmed that the partnerships assist in providing valuable market information and trends, as well as improving resource use and cost reduction. They also add a competitive advantage to partnerships as they help organizations stay ahead of the competition.

The manufacturing and engineering sectors have taken a particular interest in academic partnerships to access new technologies and develop talent. Although there is growing recognition of the benefits of industrial partnerships, academic institutions seem more focused on collaboration to enhance student learning and professional preparation. Business incubators have also been actively seeking to form partnerships with the academic sector. The industrial sector also provides support to emerging companies and fosters innovation.

63% of those interviewed expressed their desire to form industrial academic partnerships in order to effectively use extended reality technology. According to the questionnaire, approximately 53% expressed their desire to form industrial academic partnerships in order to use this technology.

Fifth question: How can academic-industrial partnerships contribute to the adaptation of Palestinian institutions to extended reality technology?

This question dives into the heart of the matter: how can collaboration between universities and industry propel Palestinian institutions into the exciting world of XR technology? The responses paint a promising picture of mutual benefit and advancement.

Responses indicate a strong consensus on the potential benefits of academic-industrial partnerships in developing XR technology and its applications and adapting it to the local market, as it contributes to assisting organizations in research and development through collaborative efforts to explore new XR applications and technologies. It also aids in talent development through collaborative initiatives, training a skilled workforce capable of stimulating innovation and creating new job opportunities.

Accordingly, institutions to adapt the Palestinian local market emphasized developing training programs based on XR for various industries, creating immersive learning experiences for students, and applying XR to address specific challenges in sectors such as tourism, healthcare, engineering, and promoting a culture of innovation and entrepreneurship.
These partnerships are crucial for promoting the adoption and impact of XR technology in the Palestinian context.

Overall, academic-industrial partnerships emerge as a critical strategy for Palestinian institutions to embrace XR technology. By fostering knowledge transfer, developing a skilled workforce, and creating innovative XR applications for education, tourism, and medicine, these collaborations can empower Palestinian institutions to thrive in the age of XR.

Sixth question: Tell me if you have the ability to adopt extended reality in your organization and if there are obstacles.

The final question explores the readiness of various organizations to adopt Extended Reality (XR) technology.

While there is clear potential for XR in sectors such as manufacturing, engineering, and tourism, the lack of infrastructure and support in education and healthcare presents significant challenges for widespread adoption in these areas some of these challenges have been mentioned in research by Nabhan et al. (2024), with 55% of organizations demonstrating their ability to build extended reality with some reservations related to training or the availability of resources, while 45% expressed their inability to adopt this technology due to the lack of the necessary infrastructure to exploit it, including tools, training materials, and people with the ability to train.

In general, the potential for enterprise adoption of XR is clear. However, limited resources and the need for training pose major challenges. In addition, some companies need a detailed explanation of how to exploit extended reality technology.

Therefore, we conclude from the answers to the interview questions that the most capable sector to adopt this technology is the engineering sector, because of the presence of qualified human cadres and the use of this technology in increasing profits, followed by the industrial and tourism sectors, and the rest of the sectors showed a strong desire to exploit this technology, although there were sometimes material obstacles and sometimes a lack of training. This was previously confirmed in the proposed model, as the readiness of organizations to adapt to the technology of extended reality was affected by two variables, one of which is the industrial academic partnership because of its prominent role in providing appropriate training to organizations and the other is the readiness of resources.

5.4 Limitations

Identifying the limitations of this study is crucial because it helps to accurately interpret the results in addition to understanding the scope of the implications of the study.

1. The non-spread of extended reality technology in the Palestinian domestic market
   The researcher worked to attach links to videos on YouTube in the questionnaire for the people who filled it out, in addition to explanations about the extended reality technique for the people interviewed.

2. The researcher conducted the study in the West Bank.
   Despite sending the questionnaire to a number of institutions in the Gaza Strip, the researcher did not receive any responses.
   Questionnaires were distributed to various institutions in Palestine, including government institutions, private companies, and educational institutions.

5.5 Recommendations

Following an analysis of the Palestinian local market's readiness for Extended Reality (XR) technology, here are some recommendations for promoting successful adaptation through academic-industrial partnerships:

The model analysis revealed that the primary factors influencing Palestinian local institutions' adoption of extended reality technology are resource availability and academic-industrial partnerships. The interviews also underscored the significance of resources and training, leading this research to suggest the following recommendations for the Palestinian industrial sector:

- Forming working groups within companies to study the possibilities of using XR in various processes.
- Collaborating with universities and technical institutes to develop XR applications tailored to specific needs in the sector.
- Participate in conferences and workshops on XR to learn about the latest developments in this field.

-

Given the significance of training and trainees, this research also proposes the following recommendations for the educational sector:

- Integrating XR education into the curricula of universities and technical institutes.
- Develop training programs for employees on the use of XR technologies.
- Conducting research on the impact of XR technologies on production efficiency and improving product quality.
- Collaborate with companies to develop joint XR projects.

Due to the importance of academic-industrial partnerships and their impact on organizational performance, this research recommended the following to government institutions:

- Allocating government programs to support companies in adopting XR technologies.
- Cooperating with universities and technical institutes to develop educational and training programs in the field of XR.

Given the pioneering role of business incubators in establishing new companies and training them on the technology and skills they need, this research recommends the following:

- Providing support to startups working in the XR field.
- Organizing training programs for startups on how to use XR technologies.
- Providing opportunities to link startups with major companies in the sector.
- Providing consultations to emerging companies on how to market their products and services.

List of Abbreviations

Abbreviation	Meaning
AR	Augmented Reality
AVE	Average Variance Extracted
XR	Extended Reality
IAP	Industrial-Academic Partnership
IR	Innovation Readiness
MR	Mixed Reality
OP	Organizational Performance
OR	Organizations' readiness to adapt
RR	Recourse Readiness
SR	Strategic Readiness
T	Trainees
TR	Training
VR	Virtual Reality

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Appendices

Appendix A

Questionnaire

استبانة قياس قابلية المؤسسات الفلسطينية للتأقلم مع تقنية الواقع الممتد

(الواقع الافتراضي والواقع المعزز)

السلام عليكم

تحية طيبة وبعد.

يرجى من مؤسستكم ملئ هذه الاستبانة بعنوان **"بحث استعداد السوق المحلي الفلسطيني للتأقلم مع تكنولوجيا الواقع الممتد عن طريق الشراكة الاكاديمية الصناعية "** وذلك استكمالاً لمتطلبات الحصول على درجة الماجستير في الإدارة الهندسية من جامعة النجاح الوطنية. ولتحقيق اهداف الدراسة، قام الباحث بإعداد هذه الاستبانة معتمداً على ما جاء في أدبيات الأبحاث العلمية، والدراسات السابقة.

لذا يرجى منكم التكرم بالإجابة عن فقرات هذه الاستبانة بكل موضوعية وامانه لأن ذلك سوف ينعكس على نتائج الدراسة التي سيستفيد منها عدد كبير من الشركات في فلسطين وكذلك المؤسسات الاكاديمية، علماً بأن البيانات هي لأغراض البحث العلمي فقط، وسيتم التعامل معها بموضوعية وأمانة وسرية تامة.

الباحث: محمد عطاونة

رقم الهاتف: 0598070094

وتقبلوا فائق الاحترام

القسم الأول

نوع المؤسسة/الشركة

- منشاة صناعية
- مؤسسة تعليمية
- مكتب هندسي
- عيادة طبية
- حرف مهنية
- جمعية
- مؤسسة خدماتية
- غير ذلك ...

عمر المؤسسة/الشركة

- 0-5 سنوات
- 6-10 سنوات
- 11-20 سنة
- أكبر من 20 سنة

موقع المؤسسة/الشركة

- محافظات الشمال
- محافظات الوسط
- محافظات الجنوب

دخل موقع المؤسسة/الشركة السنوي (دينار أردني)

- 0-20,000 دينار
- 20,001-100,000 دينار
- 100,001-200,000 دينار
- 200,001-1000,000 دينار
- أفضل عدم الاجابة

نشاط عمل المؤسسة/الشركة

- تكنولوجيا المعلومات (IT)
- استيراد وتصدير
- تعليم أكاديمي
- تعليم صناعي
- حكومي
- غير ذلك ...

هل لدى مؤسستكم شراكة مع القطاع الأكاديمي

- نعم
- لا

هل تعاملت المؤسسة مع تقنية الواقع الممتد من قبل (الواقع الافتراضي، الواقع المعزز)

- نعم
- لا

إذا كانت الإجابة لا هذه روابط تعريفية لاستخدام تقنية الواقع الممتد في بعض المجالات (شاهد أكثر مجال متعلق بمهنتك)

- في مجال التعليم

https://youtu.be/fxzFbcrhrTY

- في المجال الطبي

https://youtu.be/xW1EMBVmAW4

https://youtu.be/LcD1VgOljLg

- في مجال التدريب في المنشئات الصناعية

https://youtu.be/HcXkLjuGM4A

https://youtu.be/5AsksACwdDE

https://youtu.be/77cW1iEt2N0

- القطاع المعماري والانشائي

https://youtu.be/3cFlNhTKtsg

https://youtu.be/xn4Tx0j5gg8

- مهنيين البناء

https://youtu.be/IL_9wC4lnM0

- مهنيين كهرباء

https://youtu.be/eWeXkM1n58Y

- مهنيين ميكانيك

https://youtu.be/9lLDQRhzBAw

- في مجال التسويق

https://youtu.be/-2UT2KcnJiE

بعد تعرفك على تقنية الواقع الممتد هل مؤسستكم مهتمة بهذه التقنية

- نعم
- لا

بعد تعرفك على تقنية الواقع الممتد هل ترغب مؤسستكم بعمل شراكة مع القطاع الأكاديمي

- نعم
- لا

إذا كنت ترغب بعمل شراكة مع القطاع الأكاديمي يرجى اضافة اسم الشركة بالإضافة الى الايميل لعمل مقابلة فيما بعد

.....

من وجهة نظرك، تدريب العاملين في هذه المؤسسة باستخدام تقنية الواقع الممتد سوف يكون له التأثير التالي

- ☐ اكتساب المعرفة التي يحتاجونها بشكل أسرع
- ☐ اكتساب مهارات جديدة
- ☐ تحسين أداء العمال في المؤسسة
- ☐ سيساعد العاملين على الاندماج في العمل بشكل أفضل
- ☐ سيسهل الواقع الممتد عملية التعلم

تساهم تكنولوجيا الواقع الممتد في الاقتصاد الفلسطيني من خلال

- ☐ توفير اسواق جديدة من خلال تكنولوجيا الواقع الممتد
- ☐ إنشاء موارد افتراضية، وتداولها، وشراؤها، وبيعها
- ☐ توفر اصول جديدة عند الشركات المحلية
- ☐ تطوير الشركات بشكل أسرع عن طريق التعلم باستخدام تقنية الواقع الممتد
- ☐ غير ذلك ...

القسم الثاني

الفقرات	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
المتدربين (العامليين في الشركة أو الموظفين)Trainees					
هناك رغبة في التعامل مع تقنية الواقع الممتد					
تساعد تقنية الواقع الممتد على تحقيق أهداف التدريب بسرعة أكبر من التدريب العادي					
يوفر الواقع الممتد العديد من فرص الممارسة العملية					
يوفر الواقع الممتد للمتدربين بيئات مختلفة للتدريب					
يساعد الواقع الممتد المتدربين الحصول على الكثير من المعلومات المهمة					
يساعد الواقع الممتد المتدربين الحصول على الكثير من التفاصيل					
يرفع الواقع الممتد دافعية المتدربين للعمل على أرض الواقع					
تدريبات الواقع الممتد Trainings					
يتيح الواقع الممتد من خلال التدريبات تصميم المهام وتعيينها					
تساعد تقنية الواقع الممتد على تقليل الأخطاء أثناء التدريب					
يسهل الواقع الممتد جمع المعلومات أثناء التدريب					
يسهل الواقع الممتد عملية التدريب					
يوفر الواقع الممتد تقييم مناسب للمتدربين (يعمل الواقع الافتراضي على تقييم ادائك تلقائيا)					
يساعد الواقع الممتد في دعم اتخاذ القرارات المتعلقة بعملية التدريب					
أداء المنظمة **Organizational Performance**					

الفقرات	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
يساعد الواقع الممتد على تنمية الموارد البشرية في المؤسسة					
يمكن الواقع الممتد العاملين في المؤسسة من التعاون والعمل معا وعمل الاجتماعات (يمكن عمل اجتماعات باستخدام تقنية الواقع الممتد ويكون لكل شخص افاتار)					
يوفر الواقع الممتد فرص تعلم غير رسمية للأفراد والجماعات والمنظمات					
يساعد الواقع الممتد على توفير بعض احتياجات التعلم في المؤسسة					
يساعد الواقع الممتد على تسهيل الحصول على تغذية راجعة (هناك إحصاءات في الواقع الممتد لكل عملية تدريبية)					
يسهل الواقع الممتد في حل المشكلات التي تحتاج الى تدريب في المؤسسة					
الشراكة الأكاديمية-الصناعية **Industrial –Academic Partnership**					
تساعد الشراكة الاكاديمية الصناعية على حل بعض المشكلات في المؤسسات					
توفر تقنية الواقع الممتد من خلال الشراكة تدريب بسعر اقل بالمقارنة مع الدورات العادية إذا ما تم توفير المعدات اللازمة					
توفر الشراكة من خلال تقنية الواقع الممتد دروس حول الأجزاء التفصيلية للآلات او المباني مثلا					
توفر الشراكة الشعور بالأمان لدى العاملين لأنهم سيجربون الأنظمة بلا اضرار جسدية من خلال تقنية الواقع الممتد					
تجلب الشراكة الاكاديمية-الصناعية افاق جديدة حول التعليم من خلال تقنية الواقع الممتد					
الاستعداد للابتكار Innovation Readiness					
يتطلب الابتكار من خلال هذه التقنية موارد مادية					

الفقرات	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
يتطلب الابتكار من خلال هذه التقنية كوادر بشرية مؤهلة					
استغلال تقنية الواقع الممتد سيعمل على تشجيع الابتكار في المؤسسة					
استغلال تقنية الواقع الممتد في الابتكار ضروري لمواجهة التحديات التي تواجه المؤسسة					
الاستعداد الاستراتيجي Strategic Readiness					
وضوح الاستراتيجية يساعد في تحقيق أهداف المؤسسة					
وضوح الأهداف الاستراتيجية يساعد على التأقلم مع تقنية الواقع الممتد					
من الافضل ان تكون تقنية الواقع الممتد جزءا من الشركة					
جاهزية الموارد Resource Readiness					
يجب على المؤسسة توفير الموارد المالية لاستثمار تقنية الواقع الممتد					
يجب على المؤسسة توفير الموارد البشرية لاستثمار تقنية الواقع الممتد					
يتوفر لدى العاملين الثقة لاستخدام تقنية الواقع الممتد (لا يوجد حواجز تمنعهم من استخدام تقنية جديدة)					
استعداد المنظمات للتأقلم Organizations readiness to adapt					
تنوي المؤسسة تعزيز المعرفة والوعي لدى عامليها بتقنية الواقع الممتد					
اعتماد الواقع الممتد في المؤسسة سيفيدها بشكل كبير في تطوير المؤسسة					
تنوي المؤسسة تبنّي تقنية الواقع الممتد في المستقبل					

Appendix B

Operationalization model

Construct	Indicators	Meaning	Reference
Trainees	AP-1	Desire to deal with the XR	(Lokuge et al., 2019)(Ortiz et al., 2019)
	AP-2	Achieving training objectives	(Mulders et al., 2022)
	AP-3	Providing practical opportunities	(Mulders et al., 2022)
	AP-4	Providing different environments for training	(Mulders et al., 2022)
	AP-5	Get important information	(Mulders et al., 2022)
	AP-6	Get more details	(Mulders et al., 2022)
	AP-7	Work on the ground	(Mulders et al., 2022)
Trainings	TR-1	Design and assign tasks	(Mulders et al., 2022)
	TR-2	Reduce errors	(Papanikolaou et al., 2019)
	TR-3	Data collection	(Fracaro et al., 2021)
	TR-4	Facilitating training	(Fracaro et al., 2021)
	TR-5	Appropriate evaluation	(Fracaro et al., 2021)
	TR-6	Support decision making	(Fracaro et al., 2021)
Organizational Performance	OP-1	Human Resource Development	(Khandelwal & Upadhyay, 2021)

	OP-2	Cooperation and teamwork	(Khandelwal & Upadhyay, 2021)
	OP-3	New training opportunities	(Khandelwal & Upadhyay, 2021)
	OP-4	Providing learning needs	(Khandelwal & Upadhyay, 2021)
	OP-5	Get feedback	(Khandelwal & Upadhyay, 2021)
	OP-6	Solve training problems	(Khandelwal & Upadhyay, 2021)
Industrial – Academic Partnership	IAP-1	Problem Solving	(Delgado et al., 2020)(Hernández-de-Menéndez et al., 2019)
	IAP-2	Training Costs	(Hernández-de-Menéndez et al., 2019)
	IAP-3	Detail Lessons	(Hernández-de-Menéndez et al., 2019)
	IAP-4	Feeling safe	(Hernández-de-Menéndez et al., 2019)
	IAP-5	New horizons for learning	(Zhang et al., 2020)(Lokuge et al., 2019)
Innovation Readiness	IR-1	Material resources	(Swanson, 1994)(Swanson, 2011)
	IR-2	Qualified human cadres	(Lokuge & Sedera, 2020)
	IR-3	Encouraging innovation	(Lokuge & Sedera, 2020)
	IR-4	Facing challenges	(Lokuge & Sedera, 2020)
Strategic readiness	SR-1	Clarity of strategy	(Bharadwaj et al., 2013)(Grover & Kohli, 2013)(Nylén & Holmström, 2015)(Lokuge et al., 2019)
Strategic readiness	SR-2	Clarity of goals	(Bharadwaj et al., 2013)(Grover & Kohli, 2013)(Nylén & Holmström, 2015)(Lokuge et al., 2019)

	SR-3	Adopting new ideas	(De Regt et al., 2020)
Resource Readiness	RR-1	Providing financial resources	(Lokuge et al., 2019)
	RR-2	Providing human resources	(Lokuge et al., 2019)
	RR-3	Confidence when using new technology	(Qiao et al., 2021)
Organizations readiness to adapt	OR-1	Enhancing knowledge and awareness	(Bughin et al., 2017)(Pivik et al., 2002)
	OR-2	Approval extended reality in the organization	(Davis, 1989)(Venkatesh & Davis, 2000)
	OR-3	Adopting extended reality technology	(Davis, 1989)(Venkatesh & Davis, 2000)

Appendix C

Links to videos on YouTube introducing extended reality technology

Field	YouTube link
The education fields	https://youtu.be/fxzFbcrhrTY
The medical field	https://youtu.be/xW1EMBVmAW4
Field training in industrial facilities	https://youtu.be/LcD1VgOljLg https://youtu.be/HcXkLjuGM4A https://youtu.be/5AsksACwdDE
Architectural and construction sector	https://youtu.be/77cW1iEt2N0 https://youtu.be/3cFlNhTKtsg
Construction craftsmen	https://youtu.be/xn4Tx0j5gg8 https://youtu.be/IL_9wC4lnM0
Electrical professionals	https://youtu.be/eWeXkM1n58Y
Mechanical professionals	https://youtu.be/9lLDQRhzBAw
Marketing field	https://youtu.be/-2UT2KcnJiE

Appendix D

Interview Questions and interviewee answers

First Question: How important is virtual reality to you?

Manufacturer 1: Virtual reality is very important for us because it will help in prototyping products at a lower cost than usual and with more accuracy, and it will improve training processes.

Manufacturer 2: If I use virtual reality in the factory, I will only use it in the field of training.

Manufacturer 3: Virtual reality is not important for us because our manufacturing processes are limited.

Engineering company (Architecture) 1: Virtual reality allows customers to immerse themselves in the design, unlike traditional design, so customers can see the details of the building and view it in 360 degrees.

Engineering company (Architecture & civil) 2: Through virtual reality, customers can walk around and, in the building, and it also helps engineers interact with customers better.

Engineering company (Architecture & civil) 3: Virtual reality will add a new competitive advantage to the company and will also make it easier to display designs in an attractive way to customers.

Engineering company (Mechanical & Electrical) 4: We usually use simulation programs to model electromechanical works, so the use of virtual reality will constitute a quantum leap in modeling electromechanical works for us, and it will also help improve the performance of new trainees.

Engineering company (Mechanical & Electrical) 5: Our work is limited to designing electromechanical plans and supervising them, and we do not work on modeling these works, so virtual reality will not add additional value for our company, even if I am convinced of its importance in training new students and trainees.

Tourism company 1: Virtual reality provides an excellent experience for tourists, as it allows them to visit new sites in a unique way.

Tourism company 2: In addition to the fact that virtual reality provides tourists with a new and distinctive experience, it also achieves profits and gives the company an additional competitive advantage.

School manager 1: Virtual reality opens new horizons for students and teachers, as it helps in understanding information better, and it is also a helpful factor for teachers to diversify learning methods.

School manager 2: Virtual reality is an attractive world commensurate with technological reality, and through it, there will be tangible interaction between teachers and students.

Teacher 1: I can go deeper into the educational materials by using virtual reality and explaining ideas in a simple way.

Teacher 2: There are some tools that are not available in the school that can be met by virtual reality. In addition to that, there are parts of machines or equipment that students cannot see in reality, but they can be seen using augmented and virtual reality.

Teacher 3: It gives the student a lot of details that the teacher may not be able to comprehend in the class, and it is more realistic than teaching students from pictures in the book.

Teacher 4: Virtual reality technology is like any modern technology, but by using it, you can deliver information to students better.

Business incubator: Through virtual reality, it is possible to follow the entrepreneurs and provide their basic training needs in the location of the owner of the idea; thus, it will save time and effort for the incubator and the entrepreneurs.

Medical institution 1: Virtual reality will have great importance, especially in medical training, patient education, and surgical planning.

Medical institution 2: Virtual reality will help us in our rehabilitation programs by providing patients with interactive treatment experiences.

Medical institution 3: Through virtual reality, we can move around the human body easily, so we can perform surgeries virtually before entering the operating room.

Second question: What are the concerns or obstacles to using the extended reality technology in your institution?

Manufacturer 1: There are many obstacles; for example, the initial costs are relatively high, and there are also problems related to the compatibility between the CAD programs used by virtual reality and those used in manufacturing.

Manufacturer 2: The main obstacle is creating training content that suits our manufacturing processes and the initial cost of the virtual reality devices.

Manufacturer 3: I do not think that virtual reality is effective because it is incompatible with our manufacturing processes, and workers do not accept dealing with new technology.

Engineering company (Architecture) 1: There are many obstacles: initial costs, integration between the software that VR uses and the software that we use in design, and customer approval of the design that is powered by VR.

Engineering company (Architecture & civil) 2: Engineers need to be trained to use virtual reality hardware and software effectively and understand how to build, interpret, and manipulate 3D models in virtual reality.

Engineering company (Architecture & civil) 3: The cost of virtual reality devices represents a major obstacle, in addition to employees who are accustomed to the traditional design, and therefore some of them may hesitate to use this technology.

Engineering company (Mechanical & Electrical) 4: Developing high-quality content using virtual reality may take a long time and therefore be expensive for the consumer because it requires professionals in 3D modeling.

Engineering company (Mechanical & Electrical) 5: initial costs and software integration the need for training.

Tourism company 1: Creating content for various places, whether archaeological or entertainment in addition to the cost of virtual reality devices and maintenance.

Tourism company 2: The company needs to update the entries continuously, and in addition to that, many customers get excited in an abnormal way.

School manager 1: The lack of qualified personnel, in addition to the lack of virtual reality devices

School manager 2: One of the obstacles is the lack of virtual reality devices, and there is also no educational material. In addition, a plan must be made to use this technology at its best.

Teacher 1: VR shows very good results in education, but there is a need for research into its effectiveness as an educational tool, and teachers need training to use this technology.

Teacher 2: The student may not be able to connect virtual reality technology to the educational material (neglecting the educational material).

Teacher 3: The lack of educational materials that match virtual reality with the required material, in addition to the high cost.

Teacher 4: Inability to provide virtual reality devices

Business incubator: Many obstacles include the lack of strategic planning in some companies and the failure to form partnerships. Cost also plays an important role. There is also the ability of the organization to adapt to this technology.

Medical institution 1: limited budgets and resources, in addition to the lack of knowledge of doctors in dealing with virtual reality technology currently.

Medical institution 2: Medical institutions may need resources and expertise to provide timely assistance. Medical staff and professionals also need much training to use this technique effectively.

Medical institution 3: The lack of people who are proficient in dealing with this technology is in addition to the financial obstacle.

Third Question: What do we want XR technology to change in the learning process?

Manufacturer 1: Education should become more experimental than theoretical, in addition to developing problem-solving skills.

Manufacturer 2: Virtual reality may be a good technology for developing learners' skills and, thus, greater efficiency at work.

Manufacturer 3: Assist workers deal with new machines

Engineering company (Architecture) 1: We want virtual reality to provide interactive 3D environments where architects can view their work and thus identify design flaws and work to address them.

Engineering company (Architecture & civil) 2: Allow architects and other stakeholders to interact within a virtual space as well. Virtual reality should enable civil engineers to conduct analysis and evaluation of the sites they will be working on in a virtual environment.

Engineering company (Architecture & civil) 3: In the learning process, we hope that VR will make it easier for engineers to analyze and experiment with complex structures by providing interactive 3D models for them to practice on.

Engineering company (Mechanical & Electrical) 4: Promote collaboration and remote working among engineers and also allow engineers to work together on complex projects and share experiences without the need to be physically present.

Engineering company (Mechanical & Electrical) 5: VR should facilitate the creation of virtual prototypes for mechanical and electrical engineers.

Tourism company 1: Virtual reality can be used to train employees on customer service, interaction with guests, and emergency procedures, and it also provides a safe and realistic training environment for employees.

Tourism company 2: Providing endless sources of information to guides and tourists in an attractive way and educating tourists about the dangers of tourism in some areas

School manager 1: assisting students to understand complex topics better, simplifying difficult topics, and improving student understanding

School manager 2: Expanding students' horizons also enables them to explore cultures, languages, and sciences that they cannot learn in the classroom.

Teacher 1: Virtual reality can provide realistic simulations to train students in the skills needed for the job market.

Teacher 2: Virtual reality should be used to prepare students for real-life careers by training them virtually.

Teacher 3: Encourage learning in the classroom. It also provides students with opportunities to explore educational content individually, experience it, and interact with it in a practical way.

Teacher 4: Facilitating access to information and making students accept education better

Business incubator: Creating innovative learning experiences for startups and entrepreneurs Assist entrepreneurs in gaining essential skills, accessing resources, building networks, and preparing for the challenges and opportunities they will face as they grow their businesses.

Medical institution 1: Improve skills by simulating surgical procedures, patient examinations, and medical diagnoses and educating patients regarding their medical condition and available treatment options.

Medical institution 2: Learn anatomy and physiology because virtual reality allows doctors to explore the human body in depth. Simulate surgeries so they are very realistic.

Medical institution 3: The ability to transform healthcare and medical education by providing effective tools for education, training, and patient care.

Fourth question: Is there a tendency to create partnerships with the academic or industrial sectors? why?

Manufacturer 1: We have a high interest in partnering with academic institutions to access new technologies, and this partnership allows us to maintain our competitive edge and bring innovative products to market more quickly.

Manufacturer 2: Currently, there are no partnerships with the academic sector, but we may work to establish partnerships in the future.

Manufacturer 3: Currently, there is no intention of establishing a partnership, but it is possible in the future.

Engineering company (Architecture) 1: Currently, there are no partnerships with the academic sector, but we will seek to do so soon.

Engineering company (Architecture & civil) 2: Collaborating with the academic sector has helped us stay at the forefront of architectural innovation and reach emerging talent.

Engineering company (Architecture & civil) 3: We cooperate with universities by training their students in our company.

Engineering company (Mechanical & Electrical) 4: So far, there are no partnerships with the academic sector, but virtual reality encourages us to make such partnerships.

Engineering company (Mechanical & Electrical) 5: At present, no

Tourism company 1: We strive to establish partnerships with academic institutions in order to develop the company.

Tourism company 2: Yes, this will help us produce a lot of targeted content for tourists.

School manager 1: Currently not

School manager 2: Yes, because it is very necessary for students in vocational schools to learn about the labor market.

Teacher 1: Yes, because the partnership gives you the ability to develop professionally.

Teacher 2: Yes, because it helps to stay informed about the labor market's needs.

Teacher 3: Yes, we must maintain contact with the local market to follow developments.

Teacher 4: Yes, it is better to stay in touch with the local market.

Business incubator: The business incubator has a strong tendency to create partnerships with the academic and industrial sectors. These partnerships help startups access the necessary resources and expertise, in addition to guidance, financing, and many other opportunities that are considered essential in the market for the companies' success and growth.

Medical institution 1: Currently not

Medical institution 2: Currently not

Medical institution 3: Yes, it is necessary to establish partnerships with academic institutions, medical colleges, and research centers. These partnerships can include medical education programs and the exchange of knowledge and experiences.

Fifth Question: How can academic-industrial partnerships contribute to the adaptation of Palestinian institutions to extended reality technology?

Manufacturer 1: Academic-industrial partnerships can provide Palestinian institutions with access to the latest technological research. Cooperation with universities can also help in developing virtual reality solutions tailored to meet the needs of educational and training institutions in Palestine.

Manufacturer 2: Joint initiatives with academic partners could include virtual reality training programs that are designed to improve the skills of the local workforce. This partnership will therefore help create a pool of skilled professionals capable of implementing and using virtual reality technology effectively.

Manufacturer 3: This will be done by facilitating knowledge transfer and supporting workforce development.

Engineering company (Architecture) 1: Partnering with academic institutions will help us learn how to exploit this technology in architectural design. Therefore, this will lead to the preparation of engineers capable of exploiting virtual reality technology effectively.

Engineering company (Architecture & civil) 2: The partnership can help institutions teach engineers and students how to design and analyze structures using virtual reality technology, which will allow them to practice different scenarios, such as road construction or structural analysis, in virtual environments.

Engineering company (Architecture & civil) 3: The partnership will help increase the productivity of designers and display designs better, which will reduce engineers' errors and facilitate their work as the project's work will be simulated before it begins.

Engineering company (Mechanical & Electrical) 4: The partnership will help provide engineers with a broader horizon in designing projects, which will facilitate their work and avoid them being exposed to design errors.

Engineering company (Mechanical & Electrical) 5: The partnership can help develop designers' skills and reduce their mistakes.

Tourism company 1: The partnership could lead to the presentation of Palestinian tourist destinations using virtual reality technology that was developed in partnership with universities, and thus will help tourism companies market tourist areas in an attractive and effective manner.

Tourism company 2: The partnership can contribute to the preservation of Palestinian heritage and culture, so that visitors are educated about various heritage and cultural sites using virtual reality technology. Tourism products such as attractive displays can also be presented using this technology through the partnership.

School manager 1: The partnership will help teachers acquire many skills needed to use XR technology effectively in education.

School manager 2: The partnership will train teachers to use extended reality technology, which will facilitate the teacher's delivery of information to students in a more clear and detailed manner.

Teacher 1: This partnership may assist produce new educational resources and methods by using this technology.

Teacher 2: Helping some teachers address their educational weaknesses, the partnership provides many educational lessons using extended reality technology.

Teacher 3: Extended reality partnerships shortcut many educational courses and workshops that a teacher needs to convey a specific concept to students.

Teacher 4: The partnership will help facilitate students' comprehension and more in-depth understanding of educational concepts.

Business incubator: Exploiting the business incubator may enhance cooperation between academia and industry and will work to address the challenges facing Palestinian institutions. This collaboration will therefore be effective in driving innovation, research, and practical application of XR technology.

Medical institution 1: By providing training for doctors and health sector workers

Medical institution 2: By giving us the necessary skills to benefit from extended reality technology.

Medical institution 3: It is possible to use XR applications developed in the medical field in academic institutions to train doctors and provide them with new skills.

Sixth question: Tell me if you have the ability to adopt extended reality in your organization and if there are obstacles.

Manufacturer 1: Yes, if the necessary training is provided.

Manufacturer 2: Yes, but we need training.

Manufacturer 3: Yes, but we won't use it for now.

Engineering company (Architecture) 1: Yes, we have the ability and qualified human cadres to exploit this technology

Engineering company (Architecture & civil) 2: Yes

Engineering company (Architecture & civil) 3: Yes

Engineering company (Mechanical & Electrical) 4: Yes, we have the ability to adapt, and in addition to that, it will give us a new competitive advantage.

Engineering company (Mechanical & Electrical) 5: Yes, but it does not add any value to the company.

Tourism company 1: Yes, and our profit increased

Tourism company 2: Yes, but our tames want to training to use this technology

School manager 1: No, we don't have resources like devises and qualified trainers

School manager 2: No, there are no resources

Teacher 1: No, there are no resources

Teacher 2: No, there are no resources

Teacher 3: No, there are no resources

Teacher 4: No, there are no resources

Business incubator: No, we want a lot of financial resources

Medical institution 1: No, because there are no resources or training

Medical institution 2: No, because there are no resources or training

Medical institution 3: Yes, but we want to training

Appendix E

Institutions Interviewed

	Institution Name	Institution Type	Institution Location
1	Royal	**Manufacturer**	Hebron
2	Quzmar	**Manufacturer**	Ramallah
3	Apeco plast	**Manufacturer**	Hebron
4	**PalRoots**	**Engineering company**	Ramallah
5	League tech co	**Engineering company**	Ramallah
6	Al Rayyan	**Engineering company**	Ramallah
7	BIM solution	**Engineering company**	Hebron
8	Al-Aman Consulting Engineering	**Engineering company**	Hebron
9	Elite	**Tourism company**	Nablus & Ramallah
10	Carawan	**Tourism company**	Bethlehem
11	Ibn al-Rushd	**School manager**	Hebron
12	Hebron Industrial Secondary School	**School manager**	Hebron
13	Hebron Industrial Secondary School	**Teacher**	Hebron
14	Hebron Industrial Secondary School	**Teacher**	Hebron
15	Hebron Industrial Secondary School	**Teacher**	Hebron
16	Hebron Industrial Secondary School	**Teacher**	Hebron
17	Palestine polytechnic university	**Business incubator**	Hebron
18	Al-Amal Clinic	**Medical institution**	Hebron
19	Red Crescent Hospital	**Medical institution**	Hebron
20	Al-Ahly Hospital	**Medical institution**	Hebron

جـامعـــة النجاح الوطنية

كليـــة الدراســـات العليـــا

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قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجة الماجستير في الإدارة الهندسية، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس- فلسطين.

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الملخص

ان التطور السريع للواقع الممتد (XR) والذي يتكون من الواقع الافتراضي (VR)، والواقع المعزز (AR)، وتقنية الواقع المختلط (MR) يحمل إمكانات هائلة لمختلف الصناعات لإحداث ثورة في عمليات هذه الصناعات. ومع ذلك، يتطلب التبني الناجح لتكنولوجيا الواقع الممتد سوقًا مستعدًا لدمج هذه التكنولوجيا الجديدة. تبحث هذه الأطروحة في مدى جاهزية السوق المحلي الفلسطيني لاحتضان هذه التكنولوجيا.

وعليه تم في هذا البحث اقتراح نموذج من أجل دراسة استعداد السوق المحلية للتأقلم مع تقنية الواقع الممتد، حيث استخدم هذا البحث الاستبيان والمقابلات كنهج كمية ونوعية على التوالي، وقد غطّت الدراسة مجتمع البحث بمقدار 80 عينة؛ تمثّل الحكومة الفلسطينية والمؤسسات والشركات الخاصة. قام الباحث بتوزيع وتحليل الاستبيانات باستخدام برنامج SMART-PLS، وأجرى أيضا تحليلا يدويا لعشرون مقابلة مع مؤسسات المختلفة.

تكون النموذج من ثماني متغيرات: التدريب، والمتدربين، والاستعداد للابتكار، والاستعداد الاستراتيجي، واستعداد الموارد، وهي متغيرات مستقلة؛ والأداء التنظيمي والشراكة الأكاديمية الصناعية (IAP)، وهي متغيرات وسيطة؛ واستعداد المنظمات للتأقلم مع تقنية الواقع الممتد، وهو متغير تابع.

خلصت الدراسة إلى أن السوق المحلي الفلسطيني مستعد بالفعل لدمج تكنولوجيا XR ووفرت المقابلات نظرة ثاقبة لآراء مؤسسات فلسطينية بتقنية XR، والعوائق الموجودة وكيفية التغلب عليها عن طريق الشراكة الاكاديمية الصناعية، حيث أشارت الدراسة إلى اهتمام السوق المحلي بتقنية XR في مختلف القطاعات وخصوصا القطاع الهندسي، بالرغم من التحديات الموجودة في كل قطاع والعقبات من قيود مادية وموارد

بشرية مؤهلة، وأكدت الدراسة أن الشراكة الأكاديمية الصناعية ستساعد في تجاوز هذه العقبات والتحديات من خلال توفير التدريب ومعالجة العقبات المادية.

وعليه اوصى الباحث بإنشاء شراكات اكاديمية صناعية وتوفير الموارد اللازمة لتبني هذه التكنولوجيا في جميع القطاعات ودعم الشركات الناشئة في هذا المجال.

الكلمات المفتاحية: الواقع الممتد، الاستعداد للتكيف، الشراكة الصناعية الأكاديمية، السوق المحلي.