

Exploring the process of digital artifact adoption in entrepreneurship education

A thesis submitted for the degree of Doctor of Philosophy

by

Salim Abdullah Al Rawahi

Department of Business School,
Brunel University London

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Abstract

Entrepreneurship education (EE) has become an important subject that many higher education institutions (HEIs) are currently offering it to their learners. Furthermore, the use of digital technology in teaching EE has been among the recently discussed topics, and the use of digital artifacts (DA) in teaching entrepreneurship has been studied. However, existing literature lacks a theoretical framework that identifies the different factors that facilitate and/or impede the process of adoption of DA in EE. The process of technology adoption in EE remains understudied. This study investigates the process of how adoption of DA unfolds in EE, in Oman.

Applying grounded theory approach, the study explores the facilitating and the impeding factors to technology adoption, and the strategies to overcome the impeding factors. Data collection was achieved through semi-structured interviews with 30 entrepreneurship educators from different Higher Education Institutions (HEIs) in Oman.

The findings demonstrate that learners' positive attitude, embracing the available different technologies, educators' positive role, and management support are the main facilitating factors to DA adoption. However, the main impediment factors include the following: first, the learners' background and mentality, and their focus on grades and marks over acquiring learners. Second, educators' teaching style, their incompetency in teaching the subject, and their high teaching load. Third, the absence of management awareness, understanding, and support, and the lack of entrepreneurial culture among the institution.

Effective technology adoption involves the active engagement of various stakeholders, including learners, educators, and management. However, the educators play a predominant role in technology adoption and in improving teaching approaches. This research contributes by developing a framework illustrating the process of how DA adoption in EE unfolds overtime.

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“Great ‘indeed’ is Allah’s favour upon you!” surah An-Nisa. verse 113, Holy Quran.

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Preface

In Oman, the Ministry of Higher Education, Research, and Innovation (MOHERI) issued a ministerial decree in 2013 instructing all HEIs across the country to introduce Entrepreneurship as a compulsory course to all its learners. When I started teaching entrepreneurship in Oman in 2019, I was provided with the course materials, mainly Power Points slides. I was also dissatisfied with the teaching approach, primarily because the course content relied heavily on theory. The common practice involved lecturing with the aid of PowerPoint slides, where the educator predominantly lectured while learners listened, with limited opportunities for discussion. Learners were then tasked with presenting a business plan, and a final exam accounted for 40 to 50% of the assessment.

Unsatisfied with this approach, I believed that entrepreneurship could be taught more effectively by integrating various digital artifacts. The use of digital elements such as videos, games, and other software could help learners grasp concepts and apply their knowledge. I made efforts to change my teaching methods, incorporating more pictures and videos, making classes more engaging through group activities, and introducing additional cases. However, I consistently questioned what impediments exist for entrepreneurship educators in adopting technology effectively, especially when the benefits are acknowledged, and learners respond well to such approaches.

When I began my PhD journey, I found the challenges in entrepreneurship education to be an interesting topic for research. As I delved deeper and encountered the subject of "process and variance," I discovered it to be even more intriguing. Later on, I was able to connect my teaching experience and challenges to the research topic of process and variance. I came to understand that technology adoption is a complex process requiring various factors to work in harmony for success. It's not as simple as having one or two factors present; rather, multiple factors must align for successful technology adoption. Therefore, I deemed the phenomenon of the technology adoption process worthy of investigation, and that is the focus of this research.

Chapter 1: Introduction

1.1 Research Background

Globally, over the past three decades, entrepreneurship has attracted the attention of different stakeholders, such as academicians, policymakers, businesspeople and others (Drucker, 2017). This consideration was due to the benefits that entrepreneurship can generate. Burns (2016) pointed out that entrepreneurship encourages the growth of the economy for three reasons. Firstly, it encourages competition by increasing the number of enterprises. Secondly, it is a mechanism for 'knowledge spill overs' i.e., knowledge is transferred from its origin to others. Thirdly, it creates variety and diversity among enterprises in any location. Generally, when the word 'entrepreneurship' is mentioned, it connotes creativity and innovation, economic growth, job creation, and sustainability (Sanyang and Huang, 2010; The World Bank, 2010).

Entrepreneurship education (EE) is also booming and becoming a hot topic, attracting scholarly attention, where not only universities offer entrepreneurship related programmes and courses, but also primary and secondary schools do so, owing to its benefits (Fayolle, 2013a), such as fostering an entrepreneurial mindset among learners (Gibb, 2002; Hultén and Tumunbayarova, 2020), motivating graduates to create new businesses (Marinič, Záthurecký and Špičák, 2015; Guerrero *et al.*, 2018), developing their abilities and entrepreneurial skills and attitudes (Fayolle and Klandt, 2006), and being innovative (Cruz *et al.*, 2009). In entrepreneurship education, different issues have been and are still being published and investigated, covering topics such as content and pedagogical approaches (Tautila, 2010; Morris *et al.*, 2013; Scott, Penaluna and Thompson, 2016); learners' attitudes and perceptions (Shinnar, Pruett and Toney, 2009); evaluation and effectiveness (Cheng, Chan and Mahmood, 2009; Martin, McNally and Kay, 2013; Byun *et al.*, 2018; Lyons and Zhang, 2018; Decker-Lange *et al.*, 2020; Ncube and Lekhanya, 2021), and entrepreneurial intentions (Bae *et al.*, 2014; Zhang, Duysters and Cloudt, 2014; Van Gelderen, Kautonen and Fink, 2015; Maresch *et al.*, 2016; Nabi *et al.*, 2018; Jena, 2020).

The use of digital technology in entrepreneurship education has also been among the recently discussed topics. Nambisan (2017), Rippa and Secundo (2019), and Secundo, Rippa and Cerchione (2020) are among the prominent papers that illustrate the importance of the intersection between digital technology and entrepreneurship and the different types of digital technology that can be used in entrepreneurship in general and entrepreneurship education

in particular. Digital technologies are defined as ‘products or services that are either embodied in information and communication technologies or enabled by them’ (Lyytinen, Yoo and Boland, 2016 p. 49).

The recent infusion of digital technologies such as social media, 3D printing, artificial intelligence, and the Internet of Things (Fischer and Reuber, 2011a; Rippa and Secundo, 2019) has penetrated every organisation and changed the way of communication (Fischer and Reuber, 2011b; Greenstein, Lerner and Stern, 2013; Nambisan, 2017; Rippa and Secundo, 2019); educational institutions are not exception to this transformation. Nambisan synthesised the concept of digital technology as a result of digital artifacts (DAs), digital infrastructure and digital platforms, three distinct but related elements, where digital artifact is a term used to describe a digital component, or an application that is a part of a product and offers value to the end user (Ekbia, 2013; Kallinikos, Aaltonen and Marton, 2013). Digital infrastructure is defined as the digital technology systems and tools that provide communication, collaboration, and/or computing capabilities, such as social media and 3D printing (Nambisan, 2017). Digital platform is defined as a shared, common set of services that serves to host complementary offerings, including digital artifacts (Tiwana, Konsynski and Bush, 2010); Apple’s iOS and Google’s Android are examples of digital platforms. Nambisan (2017) emphasised the potential benefits that entrepreneurship and digital technologies can have when both intersect, and this research will explore the adoption of digital artifacts (DAs) in entrepreneurship education.

1.2 Statement of the Problem

A number of research papers have advocated for more interactive and effective ways of teaching entrepreneurship, such as experiential, action learning, and other innovative methods to replace traditional approaches (Greenstein, Lerner and Stern, 2013; Neck, Brush and Greene, 2014; Scott, Penaluna and Thompson, 2016; Maxwell *et al.*, 2019; Lackéus, 2020; Liguori, Muldoon and Bendickson, 2020). Technology adoption in teaching entrepreneurship has proven to be effective (Nambisan, 2017; Rippa and Secundo, 2019; Lesinskis *et al.*, 2023). However, it has been observed that a static and traditional approach to teaching entrepreneurship is still dominant (Peterman and Kennedy, 2003; Edelman, Manolova and Brush, 2008; Neck, Greene and Brush, 2014). Business plans and lecturing remain the dominant traditional teaching styles in teaching entrepreneurship (Carrie, 2007; Nabi *et al.*, 2017). Various research papers highlight the ineffectiveness of traditional teaching methods for the current generation of learners, and scholars have advocated for alternative

approaches in entrepreneurship education (Kirby, 2004; Ollila and Williams-Middleton, 2011; Volkmann *et al.*, 2016; Ahmad, Abu Bakar and Ahmad, 2018; Mavlutova *et al.*, 2020a). These studies underscore that the traditional approach falls short in instilling entrepreneurial knowledge, skills, and behaviour in learners (Cheng, Chan and Mahmood, 2009; Higgins, Smith and Mirza, 2013). Therefore, entrepreneurship educators, as change agents need to update their programmes to stay relevant (Teo, 2008; Mwasalwiba, 2010; Maritz, 2017; Ratten, 2017).

Since the goal of EE is to develop learners' attitudes, skills, and behaviours, enabling them to identify entrepreneurial opportunities and create ventures (McGrath and MacMillan, 2000; Davis, Hall and Mayer, 2016), learners must to be well prepared. Educators and institutions play a vital role in achieving this goal (Ratten, 2017). Learners of this generation are digital natives and rely on information technology (Ratten, 2017). They can easily master technology and tend to use it in many aspects of life including learning activities (Schwieger and Ladwig, 2018; Mustofa *et al.*, 2022). To equip learners with entrepreneurial skills, it is crucial to adopt and incorporate more innovative teaching methods (Gielnik *et al.*, 2015; Rauch and Hulsink, 2015; Sidhu *et al.*, 2015) achievable through the use of digital technology tools, like simulation games (Ratten, 2017). Integrating technology into today's classrooms can enhance learners' motivation and engagement, aiding them in improving their educational outcomes (Costley, 2014; McKnight *et al.*, 2016; Mavlutova *et al.*, 2020a; Alaboudi and Alharbi, 2021; Lesinskis *et al.*, 2023). Therefore, leveraging digital artifacts like pictures, videos, and simulation games, which simulate real-world scenarios, can make abstract ideas more practical and bridge the gap in abstract learning. Despite the potential benefits, these tools are not widely utilised in teaching entrepreneurship, and traditional methods persist (Maritz and Brown, 2013; Neck, Greene and Brush, 2014; Scott, Penaluna and Thompson, 2016; Nabi *et al.*, 2017). Thus, a key focus of this research is to investigate the obstacles to the adoption of digital artifacts (DA) in Entrepreneurship Education (EE).

There is a stream of papers that have discussed the use of digital artifact in entrepreneurship education. Some authors discussed the use of films, videos, and animation in teaching EE (Wu, Yuan and Pan, 2018; Liguori, Muldoon and Bendickson, 2020; Wraae and Walmsley, 2020). Ellborg (2018) explored the use of pictures in EE. A number of studies also have highlighted the use of learning games in EE classes (Ruskovaara and Pihkala, 2013; Grivokostopoulou, Kovas and Perikos, 2019; Isabelle, 2020). These studies have underscored the effectiveness of employing digital artifacts in teaching entrepreneurship. Nevertheless, a notable gap exists in the research landscape, as there is a scarcity of studies investigating the

process of technology adoption and elucidating the various factors that either facilitate or hinder the adoption of digital artifacts in entrepreneurship education.

1.3 Research Gap

While previous studies have explored the use of various digital artifacts in entrepreneurship education, as stated in the above section, the existing literature lacks a comprehensive theoretical framework that identifies the different factors that facilitate and/or impede the process of adoption of DA in EE. Previous studies have emphasised the importance and effectiveness of integrating digital technology into EE (Mavlutova *et al.*, 2020a; Secundo, Rippa and Meoli, 2020; de Waal and Maritz, 2022; Lesinskis *et al.*, 2023). Existing literature has discussed various types of technologies, their benefits, and impacts on learners (Rippa and Secundo, 2019; Elia, Margherita and Passiante, 2020; Secundo *et al.*, 2020; Secundo, Rippa and Meoli, 2020), there is a notable gap in exploring the educators' perspective and the challenges they face in adopting different technologies for teaching entrepreneurship. Investigating these factors and challenges is crucial as educators play a pivotal role in deciding whether to adopt technology or not. Therefore, this research aims to address this gap by unravelling the process of digital artifact adoption by entrepreneurship educators in Oman, focusing on the educators' perspectives.

Furthermore, creating the process of technology adoption by identifying the main factors that facilitate and hinder the use of digital artifact in entrepreneurship education can help the higher education management and educators work to improve the current situation and the ecosystem to maximise the benefits of using technology in the effective teaching of entrepreneurship education, which is one of the ultimate goals of teaching entrepreneurship to learners. In addition, while previous studies have looked at the factors that influence the adoption of technology in e-learning (Pinpathomrat, 2015; Zalah, 2018), M-learning (Alfarani, 2016), Interactive Whiteboard (Wong, Russo and McDowall, 2012; Kaur, 2014), adoption of medical faculty (Zayim, Yildirim and Saka, 2006), English language teachers (Al-Anezi and Alajmi, 2021), these studies do not present how the process of technology adoption unfolds over time. These studies applied a variance approach to theory, where they identified possible relationships among variables, and tested them, using a variance approach. However, a variance approach overlooks how such relationships occur (Langley, 2007). It primarily explains whether and to what extent changes in one variable influence another (Mohr, 1982; Van de Ven and Poole, 2005). Unlike the process approach, which examines how phenomena unfold over time, the variance approach fails to capture this dynamic aspect of technology

adoption. Therefore, this study will investigate how the process of technology adoption unfolds over time.

1.4 Research Aim and Objectives:

The aim of this study is to investigate the process of adoption of digital artifact in entrepreneurship education in Oman.

To address this aim, the objectives are as follows.

1. Examine practices that facilitate the utilisation of digital artifact in entrepreneurship education.
2. Examine practices that impede the utilisation of digital artifact in entrepreneurship education.
3. Identify the strategies implemented by entrepreneurship educators to overcome the impeding factors.

1.5 Research Question:

Based on the above gap, aim and objectives, this study seeks to answer the following main question:

How does the process of digital artifact adoption unfold by entrepreneurship educators?

Sub-questions:

1. What factors facilitate the adoption of DA in EE teaching practices?
2. What factors impede the adoption of DA in EE teaching practices?
3. What strategies do entrepreneurship educators implement to overcome the impeding factors

1.6 Structure of the Thesis

In the above paragraphs of the Introduction chapter, I broadly introduce the research topic. I started by offering background information about the topic of entrepreneurship, entrepreneurship education, and technology adoption. Second, I address the problem statement of this research. Third, I point out the research gap that this research aims to address. Then I articulate the research aims and objectives, and the research questions.

The coming part of the Introduction reveals detailed information about the context of the study (Oman). I start by describing the context briefly, then I move on to write about the entrepreneurship education in Oman, and the existing literature surrounds it, such as the different initiatives to promote entrepreneurship, and the challenges entrepreneurship faces in the higher education institutions.

The second chapter illustrates a comprehensive literature review encompassing several sections. Initially, I start by presenting the different definitions of EE. Then I discuss the importance of EE. Next, I explore the digital and non-digital teaching and learning methods, and I write about the use of different DA in EE. Subsequently, I present a section about the different factors that influence the adoption of technology. Afterward, a review of technology acceptance theories and models is presented. Finally, the chapter ends with an explanation of process versus variance, and the rationale of selecting process approach for this research.

The third chapter outlines the Methodology applied to carry this research aims and objectives and answers the research question. First, I begin with writing an overview of the research paradigms, interpretivism and positivism, explains the rationale for choosing a qualitative approach design, and a brief writing about grounded theory. Second, I explain the sampling and data collection process, and discuss other related topics such as data quality, reliability and validity, and ethical consideration. Third, a detailed section of data analysis process is provided to generate theory through the first order themes, the second order themes, and three aggregate dimensions.

The fourth chapter presents the findings and the analysis of the study. It begins with the first aggregate dimension, highlights the facilitating factors. The second aggregate dimension reveals the impeding factors, and the third aggregate dimension presents the strategies to overcome the impeding factors. The chapter concludes by presenting a proposed framework representing the process of DA adoption in EE.

The fifth chapter illustrates the discussion of the research questions. Here, I summarise the findings and link them to the existing literature. The sixth chapter begins with summary of the main findings. Second, I articulate the theoretical contribution to the entrepreneurship education literature, and to the technology adoption literature. Third, I discuss the practical implications to The Ministry of Higher Education, the Managements of the Institutes, and to entrepreneurship educators. Finally, I list a number of this study's limitations and the possible future studies. The following part will offer an overview about entrepreneurship in Oman.

1.7 Entrepreneurship (and) Entrepreneurship Education in Oman

1.7.1 The Context of the Study

The Sultanate of Oman is one of the Arab countries located on the eastern side of the Middle East, covering an area of 309,500 square kilometres. Muscat serves as the capital city of Oman, and it is the largest city in the country, functioning as the political, economic, and administrative centre. Oman is divided into 11 administrative governorates (Muhafazah), further subdivided into a total of 59 provinces (Wilayat). The overall population of Oman is 4,650,905, with 2,821,122 being Omanis and 1,829,783 being expatriates (NCSI, 2022). Oman is a sovereign nation currently under the leadership of His Majesty Sultan Haitham bin Tariq Al Said, who assumed office on January 11, 2020, and continues to serve as the head of state as of the present date.

When the late Sultan Qaboos Bin Said (1940–2020) assumed power in 1970, Oman's period of revival and progress commenced. Since that time, a new era has unfolded, marked by advancements across all sectors, with oil serving as the linchpin for infrastructure growth and economic expansion. Over the past 52 years, oil exports have stood as the country's primary export, contributing over 80% of the overall government revenue. While oil has been instrumental for Oman, it has simultaneously impeded the development of a resilient, diversified, and innovative economy (Al-shanfari, 2012:p.3). Policymakers recognise the unsustainability of an oil-dependent economy, and the volatile nature of oil prices underscores the imprudence of relying solely on it. Consequently, the optimal path toward achieving a diversified and stable economy involves seeking alternative sources. Numerous efforts and appeals have underscored the imperative of economic diversification, with each strategic plan prioritising this objective. However, despite these endeavours, tangible progress in economic diversification remains elusive to date (Al-shanfari, 2012).

1.7.2 Entrepreneurship (and) Entrepreneurship Education

In a symposium held in 2012, the late Sultan Qaboos emphasised the crucial importance of economic diversification in Oman. He highlighted entrepreneurship as a key factor contributing to diversification, job creation, and the reduction of the country's dependency on oil resources. Sultan Qaboos went further to declare that small and medium enterprises form the foundation of the national economy (Al-Shabibi, 2020). During the same symposium, various entrepreneurship-related initiatives were announced, including the establishment of an

authority for small and medium enterprises and the introduction of an entrepreneurship course in higher education institutions.

Building on this legacy, Sultan Haitham bin Tariq, in a speech commemorating the second anniversary of his ascension to the throne in January 2022, reaffirmed his strong support for entrepreneurship programmes. He cited their vital role in stimulating the economy, aligning with the vision set forth in the earlier symposium (Asharq Al-Awsat, 2022).

One of the primary reasons Oman must diversify its economy is to address the steadily increasing unemployment rate, particularly among university graduates. This has emerged as a significant challenge, with the unemployment rate for nationals reaching 4.97 percent in 2020, compared to 1.8 percent in 2018 and 2.94 percent in 2017 (World Bank, 2022). Currently, the labour market is saturated and lacks the capacity to absorb the annual influx of graduates from schools and universities. Consequently, entrepreneurship has been strongly advocated as a solution to reduce the unemployment rate, create more job opportunities for locals, and promote economic diversification (Shah, Amjed and Jaboob, 2020).

Oman has initiated several programmes and incentives to foster and nurture entrepreneurship. The Omani government, in collaboration with the private sector, has introduced various measures to support entrepreneurship among Omanis. A pivotal step in this direction was the establishment of the Public Authority for Small and Medium Enterprises in 2013, serving as a governmental body dedicated to addressing all aspects related to entrepreneurship. Additionally, the Al Raffd Fund was introduced as a governmental entity offering loans to both potential and existing entrepreneurs. Further, the allocation of land plots for aspiring business owners, along with other governmental initiatives, was another significant move. In complement to these efforts, private sector initiatives also play a crucial role in providing diverse services to entrepreneurs. Programmes such as 'Intilaaqah' by the Shell Group, the Zubair Small Enterprise Centre (Zubair SEC), Oman American Business Council, and Injaz offer various services including incubation, training, mentoring, and counselling. Despite these initiatives, there remains a need to enhance awareness among the general public, especially the youth, regarding the importance, benefits, and rewards of entrepreneurship. Achieving this goal can be facilitated through education (Wang and Verzat, 2011) . Therefore, entrepreneurship education stands out as a key solution to encourage entrepreneurial pursuits among learners.

Moreover, one of the key initiatives was the implementation of an Entrepreneurship Education Programme (EEP) in higher education institutions (HEIs). The Ministry of Higher Education,

Research, and Innovation (MOHERI) issued Ministerial Decree No. 71/2013 instructing all HEIs across the country to introduce a compulsory EEP. The module was mandatory for all learners enrolled starting in the academic year 2014-2015, regardless of their field of study. Additionally, the recent Oman Vision 2040 and the National Strategy for Education 2040 have underscored the importance of entrepreneurship for achieving a diversified and sustainable economy (Educational Council, 2018; Oman 2040, 2020).

It is believed that entrepreneurship education (EE) can lead learners to consider entrepreneurship as a potential career (Fayolle and Gailly, 2015) and provide them with the opportunity to understand the market's needs (Welsh, Tullar and Nemati, 2016). Kalyoncuoğlu, Aydıntan and Göksel (2017) also argue that exposure to EE can increase learners' intention to become entrepreneurs. Several studies (e.g., Athayde, 2009; Morris *et al.*, 2013; Sánchez, 2013; Costa *et al.*, 2018) have demonstrated that EE can cultivate an entrepreneurial mindset. Therefore, EE is an important step for Oman to encourage the youth to enrol in entrepreneurship and producing more 'successful' entrepreneurs is one of the primary goals of teaching EE in higher education institutions.

However, entrepreneurship education in Oman is still relatively new and faces a number of challenges. Firstly, there is a vital need for raising awareness about the importance, benefits, implementation, and training of entrepreneurship among learners and the general public. Omani youth appear to have an interest in entrepreneurship, yet they lack essential business skills, signifying the necessity of proper entrepreneurship education. Research outcomes by Belwal, Al Balushi and Belwal (2015) depict that most university learners are interested in creating their own businesses, but they lack the knowledge and skills to do so. In the same vein, Al-Abri, Rahim and Hussain (2018) reveal that the first and main challenge in creating an effective entrepreneurial ecosystem in Oman is a lack of basic knowledge and entrepreneurial skills for starting a business. Secondly, Ibrahim, Devesh and Ubaidullah (2017) found that graduates in Oman preferred to secure jobs in the government or private sector rather than start their own businesses. The authors concluded that colleges and universities need to enhance learners' knowledge of enterprises and business risk through entrepreneurship education, as learners seem not to be fully aware of the benefits and importance of entrepreneurship. Additionally, learners are exposed to entrepreneurship education only in HEIs, while secondary school learners hardly get any opportunity to have such exposure to EE. Al Mamari *et al.* (2020) recommend that entrepreneurship education should be provided in secondary schools to prepare learners to appreciate entrepreneurship as an alternative source of employment.

Furthermore, there is a shortage of educators with relevant and appropriate qualifications to teach entrepreneurship, according to a recent study by Al-Shabibi (2020). This study suggests that educators themselves may not be sufficiently competent to deliver the subject in an appropriate manner as required. Additionally, Al-Shabibi (2020) highlights that EE is dominated by a traditional teaching and learning style, where lecturing is the predominant mode of teaching and learners are not exposed to the practical aspects of the field. In a recent paper, Syed, Magd and Singh (2021) investigated whether there is a difference regarding the impact of the MOHERI EE compulsory course on learners who completed it during different semesters over the last three academic years. The findings indicate that there is no substantial difference in the learners' entrepreneurial perspectives. These results warrant further investigation, as they suggest that the course did not stimulate learners towards entrepreneurship. One possible reason is that the course might have been taught in a traditional manner, thus failing to inspire learners towards entrepreneurship. Therefore, this thesis will explore the current teaching practices used in teaching entrepreneurship.

Selecting Oman as a case study is prompted by several factors. Firstly, the majority of the current literature on entrepreneurship-related topics is centred around developed countries such as the United States, China and the United Kingdom (UK) (eg. Wu and Wu, 2017; Galvão, Ferreira and Marques, 2018; Henry and Lewis, 2018; Lin and Sekiguchi, 2020; Secundo, Rippa and Cerchione, 2020; Mohamed and Sheikh Ali, 2021). Out of over 230 reviewed papers, only three pertained to Oman. Consequently, studying Oman as a developing country would contribute to the enrichment of the entrepreneurship literature. Secondly, despite various initiatives related to entrepreneurship in Oman, entrepreneurship education remains relatively new, as mentioned earlier, with a scarcity of research specifically investigating entrepreneurship education. Therefore, studying Oman would contribute to the advancement of entrepreneurship education. Thirdly, as previously mentioned, Entrepreneurship Education (EE) in Oman encounters various challenges. Consequently, this research will investigate and propose solutions to some of the aforementioned challenges. Oman has good infrastructure, and several colleges and universities have affiliations with American and British higher education institutions. They collaborate and import the learning education framework and curriculum from Western higher education institutions (Yarahmadi and Magd, 2016), considered to be developed in their teaching and learning experience. Additionally, these institutions have been offering entrepreneurship programmes for decades. Nevertheless, when it comes to teaching EE in Omani HEIs, the traditional approach of theory and lecturing remains dominant.

Additionally, Oman 2040 Vision has underscored entrepreneurship as a means of diversification, making it intriguing to explore the alignment between educational institutions and government strategy. Therefore, studying entrepreneurship education in Oman can help evaluate the current state and provide empirical recommendations to policymakers and entrepreneurship educators for more effective entrepreneurship education, given the country's eagerness to encourage graduates to enrol in entrepreneurship. Furthermore, there appear to be no studies exploring alternative teaching methods, such as the use of digital artifacts in Entrepreneurship Education (EE) in Oman, or the various factors that either facilitate or impede their adoption. Consequently, this research aims to investigate the perceptions and experiences of educators in the process of using and adopting different digital artifacts in EE.

1.7.3 Higher Education in Oman

The Ministry of Higher Education, Research, and Innovation (MOHERI) is the governmental body responsible for supervising the higher education institutions in Oman. Currently, there is one public university, Sultan Qaboos University, six Colleges of Applied Sciences, and five Technical Colleges located in different states around the country. All the colleges are considered public higher education institutions, offering various programmes in International Business, Science, Engineering, Information Technology, and other disciplines. MOHERI continuously reviews the programmes, specialisations, and curricula to align with the market needs and demands of the private and government sectors (Al-Balushi, 2017). An entrepreneurship course is offered as a compulsory module in these HEIs.

Currently, in Oman, there are 29 private higher education institutions: nine are universities and twenty are colleges, all of which offer diplomas, two-year programmes and/or four-year programmes leading to bachelor's degrees. Some have academic affiliation or cooperation with international higher education institutions, providing similar programmes to those of their affiliated partners (Al-Balushi, 2017). Out of these colleges and universities, three currently offer entrepreneurship as a full major, with the rest are expected to follow the ministerial decree by offering entrepreneurship as a compulsory module for all bachelor's degree learners.

This chapter has provided an overview of the research topic. It has presented an introduction to entrepreneurship and entrepreneurship education, addressing the research gap, research questions, and research objectives. Additionally, it has supplied comprehensive information about the study's context and the current state of entrepreneurship. The subsequent chapter will delve into the literature review of the topic.

Chapter 2: Literature Review

2.1 Introduction

This chapter covers the existing literature related to entrepreneurship education (EE). The chapter begins with entrepreneurship education different definitions, followed by a section about the importance of EE. Then, I discuss the teaching methods used in teaching entrepreneurship, which are non-digital and digital. Next, a detailed section is presented about different DAs used in EE. After that, a section on the different factors that facilitates and/or impede technology adoption in teaching. The theories and models in relation to technology adoption are then reviewed. The chapter ends with a part explaining variance and process approaches.

2.2 Definitions of Entrepreneurship Education (EE)

There are more than multiple definitions that have been highlighted in the literature to define Entrepreneurship Education over the past 30 to 40 years, that vary from being short and specific to comprehensive and detailed. Bechard and Toulouse (1998) offer one of the early definitions of entrepreneurship education, stating that it encompasses the formal teachings that inform, educate, and train individuals aspiring to launch businesses or develop small ventures. Ramayah, Ahmad and Fei (2012) recent definition state the same idea, while Liñán (2004)'s detailed definition added that EE training is to develop the intention to become a behaviour, so the aim of EE is to instil the required skills to be an entrepreneur. From the three definitions, it can be stated that the authors are aware that EE is not only learning "about" EE, where learners gain theoretical information and understanding related to entrepreneurship (Pittaway and Edwards, 2012; Kakouris and Liargovas, 2021), but it requires some practical educating and training, an idea that many writers came after them emphasising that in order to develop entrepreneurs, teaching EE should not be only "about" entrepreneurship, but at least should be "for" entrepreneurship, and the ultimate goal is to teach "in" or "through" entrepreneurship, where learners ultimately are capable and ready to create and run their own businesses (Pittaway and Edwards, 2012; Sirelkhatim and Gangi, 2015; Kakouris and Liargovas, 2021).

A number of authors such as (Jones and English, 2004; Rae, 2005; Fayolle, Gailly and Lassas-Clerc, 2006; Engle *et al.*, 2010; EC, 2014) generally agree that EE is a process or a

formal structure of a set of skills taught to the learners to be able to create ventures, as for example EC (2014) defined entrepreneurship education as ‘learners developing the skills and mind-set to be able to turn creative ideas into entrepreneurial action’ (p.9). The researchers also agree that these skills and behaviours can be acquired by learners through learning and teaching practices. In general, the definitions highlight the importance of set of skills required to be a potential entrepreneur. Some of the essential skills that have been highlighted are developing and improving the required competencies, recognising an opportunity, and acting upon them. These skills and others are usually discussed and emphasised in EE classes. The following table presents a set of different definitions of EE discussed above.

Table 1: Different Definitions of Entrepreneurship Education (EE)

	Different Definitions of Entrepreneurship Education (EE)	Author(s)
1	EE is defined as formal teachings that inform, educate and train those who want to start businesses or develop small ventures	Bechard and Toulouse (1998)
2	‘the whole set of education and training activities-within the education system or not-that try to develop in the participants the intention to perform entrepreneurial behaviours, or some of the elements that affect that intention, such as entrepreneurial knowledge, desirability of the entrepreneurial activity or its feasibility’.	Liñán (2004:166)
3	‘the process of providing individuals with the ability to recognise commercial opportunities and the insight, self-esteem, knowledge and skills to act on them’	Jones and English, 2004, p. 416)
4	‘learning to recognise and act on opportunities and interacting socially to initiate, organise and manage new ventures’	(Rae, 2005, p. 324)
5	‘any pedagogical [program] or process of education for entrepreneurial attitudes and skills’	Fayolle, Gailly, & Lassas-Clerc, 2006, p. 702
6	‘to let learners, know of the skills necessary to successfully start a business and help build their confidence in being able to perform those activities’	(Engle et al., 2010, p. 51),
7	EE is ‘the collection of formalised teachings that inform, train and educate learners who are interested in setting up a business’	Ramayah, Ahmad, and Fei (2012:69)

8	'learners developing the skills and mind-set to be able to turn creative ideas into entrepreneurial action'	(EC, 2014, p. 9).
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This research would rely more on Liñán (2004) definition as a practical definition, as it focusses on learning and acquiring entrepreneurship skills through any learning means, and nowadays, entrepreneurship educators can use different digital artifacts to teach entrepreneurship to the learners. The other definitions complement the goal of EE, as they highlight the aspect of the set of skills and behaviours required to be an entrepreneur, while educators and the institutes have a major impact on instilling the required skills.

2.3 Importance of Entrepreneurship Education

The importance of entrepreneurship education lies in its ability to offer the skills and knowledge in relation to entrepreneurial activities. The Global Entrepreneurship Monitor (GEM) highlights in its (2008) report that entrepreneurship has a critical role in increasing the economic development through employment, welfare effects, and innovation. Recent estimates record that there are more than 3,000 institutions offer entrepreneurship programmes (Morris and Liguori, 2016). This number of entrepreneurship courses reflects its importance to the different stakeholders (Katz, 2003; Matlay and Carey, 2007), following the believe that education is the best to equip the leaners with the necessary skills and knowledge for future employability (Adcroft, Dhaliwal and Willis, 2005). In the same vein, Liñán, Rodríguez-Cohard and Rueda-Cantuche (2011) state that EE is crucial to gain the required knowledge, skills, and experience needed for coming up with an idea, that can be followed by initiating and operating a business. EE found to boost the innovation behaviour of individuals (Cruz *et al.*, 2009). Individuals who have gained entrepreneurial skills are more able to identify new business opportunities, as they have gained different skills to do so (Ratten and Jones, 2021). Fielden, Davidson and Makin (2000) paper show that lack of adequate knowledge and training on how to achieve sustainability and run the business are observed among potential and nascent entrepreneurs, and such challenges could be illuminated by offering entrepreneurship training programmes.

Entrepreneurship education is one of the main activities that universities over the world offer to their learners, as a form of knowledge transfer with the intention to promote entrepreneurship among learners. The importance and benefits of entrepreneurship education cannot be denied. Its benefits vary from fostering an entrepreneurial mindset among learners (Gibb, 2002), developing their abilities and entrepreneurial skills and attitudes (Fayolle and Klandt, 2006), motivating graduates to create new businesses (Guerrero *et al.*, 2018), and

also as an economic development facilitator (Lindh and Thorgren, 2016). Kourilsky (1995) highlights that EE helps in learning about selection of opportunities, and resource organisation, and (Jones and English, 2004) add that EE provides the skill to recognise business opportunities, and stimulates self-esteem on entrepreneurs. Dalmarco, Hulsink and Blois, (2018) research find that learners are more likely to gain entrepreneurial skills through university education and training, and San Tan and Ng (2006) study result that EE is a factor to increase the entrepreneurs' confidence to participate in high growth businesses.

There is a growing consensus that all individuals should receive some form of entrepreneurship training (Gibb, 2002). This perspective is supported by research indicating that graduates with entrepreneurship education are more likely to start their own businesses, become self-employed, and express higher job satisfaction (Charney and Libecap, 2000). Furthermore, it was also revealed that learners after EE programme are more inclined to become entrepreneurs (Davidsson and Honig, 2003; Athayde, 2009b). In the empirical research conducted by Wei, Liu and Sha (2019) a positive relationship between EE perception and innovation perception was uncovered. The research indicated that EE programmes do not only impart skills and knowledge but can also reshape learners' attitudes and behaviours towards entrepreneurship. Learners acquire and exchange valuable resources through persuasion and collaboration during participation in learning, contributing to the establishment of a shared social resource network and enhancement of their professional skills. Entrepreneurship education is also vital as it can create greater awareness among trainees about the opportunities and threats in the market and how to deal with them (Bae *et al.*, 2014). Furthermore, EE courses and programmes generally emphasise practical skills, bridging the gap between theory and practice (Ratten and Jones, 2021).

Conversely, entrepreneurship education has its own constraints. Striking a balance between practical and theoretical learning is vital (Fayolle and Gailly, 2015), while Gibb (2002) and Sogunro (2004) appeal that the teaching method of lecturing is not as effective as other means as 'learning by doing' for example, and educators should explore alternative teaching methods. In the same vein, Potocan *et al.* (2021) comparative study between Slovenia and Croatia learners reveal that both consider the practical involvement of the educator is extremely vital. There is also emphasis that the programmes should offer a realistic view of new venture management, and not to focus solely on the bright side of entrepreneurship (Johannisson, 2006), presenting entrepreneurship as it is in reality. Another vital comment is that university learners usually lack work experience which can result in difficulty in developing a proper business idea (Robertson *et al.*, 2003), and this lack of experience can hinder the creation of viable businesses. Despite numerous initiatives by governments and educational

institutions worldwide to encourage entrepreneurship education and training programs, the effectiveness of these programmes is not guaranteed. Further research is also needed to explore effective methods of teaching entrepreneurship (Farashah, 2013; Ahmad, Abu Bakar and Ahmad, 2018; Lackéus, 2020; Mukesh, Pillai and Mamman, 2020). Additionally, some research suggests that entrepreneurship programmes may not always have a positive impact on learners. In fact some studies have reported mixed or negative results, as evidenced by (Mentoor and Friedrich, 2007; Lanero *et al.*, 2011; Chang and Rieple, 2013). The mixed or negative outcomes can be attributed to various reasons, and one possible factor could be the learning and teaching methods used in teaching EE. Pittaway and Cope (2007) called for deeper investigation in this regard. Several authors have criticised the dominant traditional, and theoretical manner in which entrepreneurship is taught, suggesting that it may not achieve the intended goal of providing effective entrepreneurship education. With the rapid environmental changes caused by digital transformation, additional entrepreneurial skills are required, such as the ability to use different digital technology and leverage them effectively (Jones *et al.*, 2017). These skills can be explored and developed within EE classes. As learners' interest in entrepreneurship grows, offering courses in a more interactive and practical manner can significantly impact their outcomes. However, the current literature generally states that entrepreneurship is taught using traditional methods. The following section will explore the available learning methods used in teaching entrepreneurship.

2.4 Non-digital Teaching and Learning Methods

It is worth mentioning that none of the previous definitions of entrepreneurship education (EE) have specified any particular methods of learning. This observation suggests that different learners may have varying learning styles, and educational methods are subject to continuous change and improvement. Despite its significance, the use of an appropriate method for teaching EE is a crucial aspect in motivating and persuading learners to become entrepreneurs. Indeed, the chosen teaching method in EE 'will be decisive factors of success for entrepreneurship education in the twenty-first century' (Fayolle, Gailly and Lassas-Clerc, 2006, p711).

There are various teaching methods applied in teaching entrepreneurship education in universities worldwide. Mwasalwiba (2010) notes that authors tend to categorise teaching methods into two groups, referred to as "traditional methods" and "innovative methods," or "passive methods" and "active methods," respectively, or "traditional" verses "non-traditional". Examples of traditional teaching methods include lectures, seminars, workshops, case studies

(Maritz and Brown, 2013) , and lecture slides(Curtis, Moon and Penaluna, 2021). While they offer advantages such as presenting information in a “consistent and predictable manner” (Honig, 2004, p.264), they also have disadvantages when used in delivering entrepreneurship education (Maritz and Brown, 2013). For instance, educators present various entrepreneurship topics to learners, who play a passive role without applying or experiencing what is being learned. This approach contradicts the literature stating that entrepreneurial learning is achieved through activity and experience (Minniti and Bygrave, 2001; Cope, 2003). The traditional teaching methods teach learners to obey and duplicate, whereas entrepreneurship emphasises building more independent skills, such as making their own judgements, taking risk and creating their own jobs. Such skills cannot be effectively taught using traditional methods (Chen *et al.*, 2015).

Higgins, Smith and Mirza (2013), as well as Neck, Brush and Greene (2014) have also criticised the traditional methods used in EE, noting their tendency to focus on theory rather than practical learning. Scott, Penaluna and Thompson (2016) also describe the traditional methods as ineffective in achieving their goals, asserting that they are “not ambitious enough to achieve effective outcomes” (p.88) given their reliance on a lecturing style lacking evidence of effectiveness. Despite criticism, traditional methods remain the most common forms of delivering entrepreneurship education (Maritz and Brown, 2013). A study by Hytti and O’Gorman (2004) and highlighted similar results. Ruskovaara and Pihkala (2013) state that the traditional learning style persists because it usually requires less effort, and the ready-made materials are welcomed by teachers.

Due to the weaknesses mentioned above regarding traditional methods, many “non-traditional methods” in teaching entrepreneurship have emerged and are becoming more common (Maritz and Brown, 2013). Non-traditional methods include experiential approaches like ‘learning by doing’ such as study visits, project-based learning, and problem-based learning (Fayolle, 2013). Minniti and Bygrave (2001) indicate that learning by doing approach involves “repetition and experimentation that increases [an] entrepreneur’s confidence in certain actions and improves the content of his stock of knowledge” (p. 7). Experiential approaches are now both commonplace and often empirically proven effective (Kassean *et al.*, 2015; Mandel and Noyes, 2016), and there is a reasonable level of agreement that this approach is feasible in teaching entrepreneurship education (Liguori, Muldoon and Bendickson, 2020), as the approach focuses more on practical and active exercises to deliver the intended lessons. Scott, Penaluna and Thompson (2016) describe the experiential methods as interactive, realistic and participative. While previous studies have emphasised the benefits of using experiential approach, they often overlook the challenges that educators encounter when

implementing such methods. Nevertheless, Liguori, Muldoon, and Bendickson (2020) highlighted the challenges when choosing a film for EE class.

A number of studies have also emphasised the importance and effectiveness of action learning in EE (Rae, 2005; Järvi, 2015; Ho *et al.*, 2018). Järvi (2015) claims that entrepreneurial learning is an ongoing process, and the entrepreneurial skills and behaviour can be developed through action learning. Marquardt and Banks (2010) define action learning as a process that allows groups and individuals to learn while solving problems and implementing actions. The approach assumes that process of learning will be more efficient when using real work-based problem, as it provides practical insights to the learners (Revans, 2016). Mukesh, Pillai and Mamman (2020) finding show that EE learners exposed to action learning methods have significantly higher level of entrepreneurial self-efficacy and entrepreneurial intention compared to learners with traditional teaching methods. Curtis, Moon and Penaluna (2021) empirical study over six years provides evidence that active teaching approaches, using real-life case studies, have helped in developing EE learning to learners. Learners were exposed to different learning approaches, such as dealing with real companies and applying critical evaluation and reflection.

The aforementioned studies concur the effectiveness of experiential and action learning methods used in teaching EE. However, Scott, Penaluna and Thompson (2016) conclude that studies about experiential learning approach is not constructed upon how effective they are, particularly, there is no sufficient robust evidence if these approaches are more effective in enabling learners to achieve the desired learning outcomes, which are implementation or innovation. Bell and Bell (2020) indicate that experiential approach criticised of lacking empirical validation, and therefore, scholars have also raised the question, 'learning by doing what?' (Kirketerp, 2012; Lackéus, 2013), as the 'learning by doing' approach still lacks a clear answer.

To summarise, the traditional teaching method, often relying on lectures and business plans, may not effectively encourage innovation, creativity, or entrepreneurial ventures among learners. While non-traditional methods, such as guest speakers and teamwork, offer some benefits, they often lack the integration of digital technology. This limitation restricts learning experiences to the classroom setting and hinders the development of real-world entrepreneurial skills. Utilising and incorporating digital technology is vital in today's classrooms, as Henriette, Feki and Boughzala (2016) state that using digital technology tools in teaching satisfies the current educational standards. Approaches like guest speaker, writing a business plan and teamwork (non-traditional methods) usually do not involve digital

technology. It may be also stated that the experiential and action learning approaches benefit learners only inside the classrooms, unlike the digital technology, where learners can benefit from them inside as well as out outside the classroom. Solomon (2007) highlighted those methods such as role-play, case studies, and guest speakers are usually implemented inside the classroom. He further indicated that it is extremely rare for EE to take place outside the classroom. Hence, Solomon encourages investigating other methods that can be utilised inside and outside the classroom setting, and digital teaching methods can serve this purpose. The following section will provide detailed literature about the digital technology and the digital teaching methods used in EE.

2.5 Digital Teaching Methods (Digital Artifacts)

With the rapid development of the current digital technology, utilising various digital learning methods is assumed to be more effective and attractive to learners. The emergence of digital technology has also changed the way knowledge is gained, transmitted and used (Ediz, 2018). This provides an advantage for educational institutions to embed digital technology in their teaching practices. The contemporary class environment now necessitates educators to integrate new ways to engage with learners, as learners are attached to devices and often find traditional teaching methods boring (Liguori, Muldoon and Bendickson, 2020). Thus, Higher Education Institutions accept the use of different communication technologies in their teachings with the aim of increasing learners' participation, and engagement, and enhance their learning experience in the educational process (Lim, 2017).

With the presence of the different social network sites such as YouTube, Instagram, Twitter and TikTok in the learners' daily lives, it is challenging to disconnect them from these networks. Therefore, educators are expected to adapt their teaching methods to create more improvements in the incentive and engagement of learners by incorporating technology in teaching and learning practices (Santos, Batista and Marques, 2019). According to Rippa and Secundo (2019), the full capacity of digital technology, particularly in teaching, is not fully utilised. There is still reluctance from many educators to embrace the digital world (Ratten, 2020). In fact, in EE, one of the challenges is to realise the full potential of emerging technologies, starting from a basic awareness about their potential role (Lombardi, 2019). Entrepreneurship educators need to revise their teaching methods to stay relevant, and utilise, where possible, the appropriate tools that learners get interested in. Learners nowadays are digital natives as they are tech-savvy and rely on information technology (Ratten, 2020). New digital learning modes that enable a mixture of online and face to face content are becoming common, and such technology can play a pivotal role in entrepreneurship education (Kirk and

Rifkin, 2020), as these technologies, such as digital artifacts, can be used as tools and methods to deliver the intended lessons.

Learners prefer innovative and practical teaching methods when learning entrepreneurship (Mavlutova *et al.*, 2020a). This aligns with Kent's statement that "entrepreneurship education must be entrepreneurial" (Neck and Greene, 2011.p. 284), emphasising that teaching entrepreneurship requires preparing creative and innovative approaches that engage learners with the teaching content. According to Briz-Ponce *et al.* (2017) and Nabi *et al.* (2017) learners are more interested in courses where interactive and modern learning technologies are in use. However, Curtis, Moon and Penaluna (2021) recent study reveal that the current practice is still passive and traditional. This implies that the use of digital technology in EE classroom is still rare, and there could be different factors that impede educators from adopting a more digital learning style, a topic that this research will investigate.

Teaching entrepreneurship can be summarised by Hindle's (2007) approach: Teach it; Teach about it; Teach it in lots of different ways and places. This suggests that teaching entrepreneurship in new ways is advisable, as the goal is not for learners solely to gain information but get involved in business creation. In additionally, teaching entrepreneurship using various digital technologies may motivate learners to be entrepreneurs. Monllor and Soto-Simeone (2020) study in USA that explores the role of digital technology in developing the entrepreneurial self-efficacy and intentions of 131 university learners. The results indicate that learners' exposure to digital manufacturing technology has a positive impact on their intentions to become entrepreneurs. Hence, this research aims to focus on this aspect of teaching and learning - the digital learning method - as the intended method to be used in EE classes. The research also aims to address the challenges that educators encounter in applying more digital learning tools in EE classes.

Despite the above categorisation of different teaching methods, a study of 141 entrepreneurship educators by Bennett (2006) concluded that there was no clear agreement on the right method to teach entrepreneurship. In the same vein, Ratten and Jones (2021) and Bae *et al.* (2014) state that there is no specific method that will grantee the successful creation of entrepreneurs. Hytti and O'Gorman (2004) argue that the method for teaching entrepreneurship should depend on the objectives; for example, if the aim is to increase awareness and understanding of entrepreneurship, public channels such as lectures, and seminars may be suitable. If the objective is to prepare learners to act as entrepreneurs, then providing experiments and trying entrepreneurship in a controlled environment, like business simulation and role playing, may be appropriate (Ahmad, Baharun and Rahman, 2004).

However, it does not seem logical that the purpose of teaching entrepreneurship is merely awareness and gaining knowledge, especially considering the contemporary discussions about the multiple benefits and advantages of entrepreneurship. With the current movement of promoting entrepreneurship, the expected goal is that learners do not learn entrepreneurship solely for the sake of acquiring knowledge. Instead, the anticipation is that (EE) will exert a substantial impact on them, potentially leading to activities such as creating a business, participating in one, or applying an entrepreneurial mindset even in traditional employment. Generally, learning about entrepreneurship is expected to generate positive outcomes for learners. Nevertheless, using interactive and appealing learning methods, particularly by integrating technology in teaching EE, learners may find the subject more enticing and be more inclined to take practical action, the ultimate goal of offering entrepreneurship to the learners.

The following section will discuss in detail the different digital artifacts that can be used in teaching EE to understand better its purpose of usage. The part covers the definitions of digital artifact, then the types of digital artifacts, and characteristics of digital artifact, and after that will discuss the available research on the different digital artifacts used in teaching entrepreneurship.

Eck, Uebernickel and Brenner (2015) state that there does not seem to be a widely accepted definition for digital artifact. Drawing from the works of Orlikowski (1992) and Kallinikos, Aaltonen and Marton (2013), Eck, Uebernickel and Brenner (2015) formulate the following definition: 'a digital artifact is an object created by and composed of digital technology and the outcome of coordinated human action. It is created and changed by human actors, but it is also used by humans to accomplish some action' (p.12). Presently, one of the most commonly cited definitions of a digital artifact is that it is a digital component, application, or piece of media content that is part of a new product (or service) and offers a specific functionality or value to the end-user (Eckbia, 2013; Kallinikos, Aaltonen and Marton, 2013). von Briel, Recker and Davidsson (2018) also borrowed the definition from Eckbia (2013) and (Kallinikos, Aaltonen and Marton (2013) and defined a digital artifact as "man-made purposeful objects embodied in information and communication technology components of software and hardware." It is worth mentioning that some authors use the form "digital object" instead of digital artifact, as in (Hui, 2012; Faulkner and Runde, 2019). The above-mentioned definitions agree that a digital artifact is not a physical object; it is a digital object or component that can be in different forms such as a video, an audio, a clip, or a piece of software, created by individuals for different functions and values. However, Bailey, Leonardi and Barley (2012) definition of digital artifact seems to focus on software exclusively.

While the number of definitions for digital artifact or digital object is limited, most research papers provide specific examples. Ekbia (2013) suggests that blogs, wikis, and webpages are examples of digital artifacts, while Nambisan (2017) offers examples like components or applications found on smartphones (e.g., Google Map), apps on smart watches, automobiles, and home appliances (such as Oral-B's connected toothbrush, Amazon Dash button, and Nike 1 Sensor).

Given that this research focuses on the digital artifact materials used in teaching entrepreneurship education (EE), the digital artifacts in this study encompass digital objects such as pictures, videos, audios, applications, and simulation games. These objects can be employed as teaching tools in EE classes. Table 2 summarises the definitions of digital artifacts.

Table 3: Different definitions of digital artifact

Author	Definitions of digital artifact (DA)
(Bailey, Leonard and Barley, 2012)	'Digital artifacts can be defined generally as software-based information technology (IT) that has the capability to mediate and present semiotic relationships.'
(Ekbia, 2009; Kallinikos, Aaltonen, & Marton, 2013).	'A digital artifact is defined here as a digital component, application, or media content that is part of a new product (or service) and offers a specific functionality or value to the end-user.'
(von Briel, Recker and Davidsson, 2018)	man-made purposeful objects embodied in information and communication technology components of software and hardware. Borrowed from Kallinikos et al. (2013) and Ekbia (2009).
(Nzembayie, Buckley and Cooney, 2019)	Components that form part of a new product or service
Eck et al. (2015)	'A digital artifact is an object created by and composed of digital technology and the outcome of coordinated human action. It is created and changed by human actors, but it is also used by humans to accomplish some action. Digital artifacts fundamentally differ from physical artifacts in that they are

	interactive, editable, reprogrammable, distributed, modular, granular, and reflexive.’ (p.12)
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The following section will explore the existing literature on various types of digital artifacts such as videos, pictures, games and specific software used in EE classrooms. This exploration aims to identify the limitations present in these studies and to highlight the gap that this current study intends to address.

Different studies have highlighted the utilisation of films and videos in delivering entrepreneurship lessons. These studies agree that video presentations can be an effective method for delivering entrepreneurship content. Videos offer vivid examples of situations and cases, facilitating a better understanding of the content. Indeed, Goodyear and Steeples (1998) indicate that using videos for educational purposes can present subject matter in a clear and impactful manner, aiding in the articulation of tacit information and knowledge that may be challenging to explain through narrative text.

Liguori, Muldoon and Bendickson (2020) paper outlines the reasons and methods for incorporating films into entrepreneurship classrooms. The paper concludes that films enhance interest, illustrate teachable moments, and accommodate different learning styles. Films are considered valuable teaching tools that support classroom engagement through discussion, aiding learners in understanding entrepreneurship concepts more effectively. In Wraae and Walmsley (2020) empirical paper, the focus is on understanding how learners develop their entrepreneurial identities through the use of video clips and narration. The findings indicate that self-reflective video clips, used as a form of assessment, can foster self-awareness and shape entrepreneurial identities. Wu, Yuan and Pan's (2018) study examines the effectiveness of PowToon, a web-based video tool, in presenting business plans. The study found that learners presenting via PowToon attracted more investors than those who did not use animated videos. Nonetheless, these studies primarily address the use of videos or films from learners' perspective and their effectiveness. None of them highlights the educators' perspective, including factors facilitating or impeding the adoption of digital teaching practices in EE, nor do they explore the process of digital artifact adoption.

Furthermore, the use of visual aids can be a powerful tool in delivering lessons about entrepreneurship. The following picture is one example.



Figure 1: The Success Iceberg

Source: <https://andyblumenthal.medium.com/the-success-iceberg-1866a5efd1c0> (2021)

Such pictures can effectively convey messages about the hardships, difficulties and challenges that an entrepreneur may encounter on their path to success. This does not imply that educators intend to instil fear in learners, but rather to mentally prepare them. It is anticipated that such images would consistently linger in the learners' minds, emphasising that entrepreneurship is not without challenges. Consequently, the incorporation of visuals in Entrepreneurship Education (EE) classes can effectively communicate intended lessons.

There is limited literature discussing the use of visuals in EE classes. Ellborg's (2018) paper explores the experiences of entrepreneurship educators who employ visual exercises (pictures) as a teaching approach. The educators found that these exercises facilitated visualisation and provided a platform for learners to express their perspectives. Additionally, it helped educators gauge learners' prior knowledge on the subject, enabling them to tailor their teaching methods accordingly. The approach emphasised the absence of a right or wrong answer, encouraging learners to freely express themselves. In a different context, Simeone, Secundo and Schiuma (2017) paper investigates how design elements, including artifacts, sketches, and visual pictures, can serve as a means of knowledge transfer among stakeholders speaking different languages. The paper discusses the use of design in open innovation-based research and development (R&D) projects. The results show that design

can be a powerful tool to support knowledge flow among different stakeholders, yet the study is not in the context of entrepreneurship education; it is rather implemented in a lab.

Learning games (serious games) are games that simulate the real world, and they allow learners to play in virtual worlds that mirror playing, observing, creating and thinking about entrepreneurship (Jones, 2007; Neck and Greene, 2011). The use of serious games (SG) in teaching entrepreneurship has gained popularity, as numerous studies have highlighted their effectiveness in delivering entrepreneurship lessons interactively. Ruskovaara and Pihkala (2013) research presents evidence that using a serious game in digital game-based learning (DGBL)- games explicitly designed for educational purposes with clear learning effects (Fellnhöfer, 2015) -, has an impact on the entrepreneurial behaviour and intentions of the user/player. The research shows that SGs can be an effective teaching tool in EE classes, yet the study was carried out in basic and upper secondary education, not in a university level, and no information was provided about the mechanism of using serious games. In the same vein, Grivokostopoulou, Kostas and Perikos (2019) outcomes also reveal that gamified learning activities support in bridging the gap between theory and practice, increase learners' motivation and comprehension of entrepreneurship related concepts. The study has highlighted that providing an effective EE framework is highly desired, yet it is challenging. The paper failed to mention any specific challenges from educators' perspective.

Another experiment found a significant difference in entrepreneurial behaviour and intentions among SG players compared to the non-players. Using theory of planned behaviour, the research suggests that SGs can be considered as an effective tool to in EE teaching classes, as they stimulate entrepreneurial skills and behaviours (Fellnhöfer, 2015) . Isabelle (2020) report through gamification, learners can experience the entire entrepreneurship process from ideation to the launch of a real business. The programme required learners to gain multidisciplinary knowledge of business concepts such as management, marketing, and finance so that they can launch and operate their virtual venture during the 12- week course. The game also allows learners to earn points, complete specific tasks, make sales and profits, and reach milestones, reflecting the real-world business environment. The author concludes that the use of technology-mediated learning methods can enhance learners' experience, engagement, and entrepreneurial self-efficacy. Finally, Dichev and Dicheva (2017) state that gamification is not only a technology, but also a methodology that can change behaviour. Therefore, while using gamification can be an effective way to teach entrepreneurship, there is a lack of studies that explore the educators' perspective on the matter. The educator's voice is vital to identify weaknesses and implement technology effectively to benefit learners and achieve the objectives of teaching entrepreneurship.

There are other ‘innovative’ ways to use technology to teach entrepreneurship. Mavlutova *et al.* (2020b) use digitally automated software to test and improve the viability of learners’ business ideas. The software has the ability to propose different recommendations and suggestions based on input information, such as past data, the economic environment, and industrial statistics. The author finds the approach suitable and useful method, as it can test ideas before starting the business, and such a tool can increase the business survival rate. However, this simple research does not apply a specific theory and has only looked at the learners’ experiences; and no information was provided about the educators’ point of view regarding the process of implementing the used software. The following section will explore the different characteristics that digital artifacts possess.

A number of authors have highlighted the different characteristics that digital artifacts possess. Zittrain and Lessig (2009) as well as Yoo, Henfridsson and Lyytinen (2010) state that digital artifacts possess unique characteristics such as being editable, transferable, open, and malleable. Digital artifacts are flexible and can be modified or updated regularly. Editability of the digital artifact can take different forms; it can be achieved by adding or deleting existing elements, editing some functions of the elements, or rearranging the elements. Another form of editability is built into the core of the object through regular updating of the data file, content, and items. This can be observed in blogs, booking systems, or currency exchange systems. Kallinikos, Aaltonen and Marton (2013) describe the characteristics of digital artifacts in a slightly different way than previous authors, and these characteristics are as follows: Reprogrammability/openness, editability/interactivity, and distributability.

Reprogrammability/openness: they are open and generative.

Editability/interactivity: digital artifacts can be continuously assembled and reassembled.

Distributability: they are transferable and duplicable.

Such characteristics of digital artifacts can offer novel functionalities and generate new entrepreneurial opportunities. For example, a digital artifact can be found in the case of software, where software firms are able to make changes even after launching the software. These changes could be due to the new market segment’s needs and requirements (Yin, Davis and Muzyrya, 2014). Moreover, when the characteristics of digital artifacts interact with other contextual characteristics, it can drastically change the meaning of value in a market. For instance, drones have been recently reprogrammed to play roles beyond their initial military applications. They are now finding new opportunities and value in various industries such as the real estate industry, logistics, agriculture, and oil and gas exploration (Nambisan, 2017).

The above-mentioned characteristics of the digital artifacts provide them with advantages that can be utilised in the teaching and learning process. Ekbia (2009) portrays digital artifacts such as webpages, blogs, and wikis as lacking a clear identity, due to the continuous change they undergo. Such artifacts, Ekbia claims, exhibit a “dubious ontology,” as they do not own the features that can be applied to perceive and identify physical objects. Therefore, such features provide benefits for learning and teaching purposes. For example, pictures and videos are distributable digital artifacts that can be shared with the learners, and also posted and shared on different social networking sites.

Games and software are often editable or reprogrammable, allowing these digital artifacts to be adapted to suit the educational environment. Features can be added or deleted as needed. Moreover, the various characteristics of these digital artifacts offer benefits beyond the classroom. Learners can watch videos repeatedly, visit websites or software programmes to practice and reinforce what they have learned in class. This interactive learning approach, coupled with the ability to revisit content even after classes, can motivate learners to understand and apply the concepts learned. Therefore, educators' awareness of the diverse characteristics of digital artifacts can inspire them to integrate various digital tools into entrepreneurship education classes, fostering interactive learning experiences and empowering learners even outside the classroom setting, ultimately nurturing entrepreneurial motivation.

Though the above-mentioned studies have explored the use of different digital artifacts in entrepreneurship education, they did not cover the gap that this study aims to explore. None of the studies have discussed the process of how the use of digital artifacts unfolds over time. The majority did not highlight the challenges educators face in implementing the use of digital artifacts. In general, the studies' main goal was to prove the effectiveness of using digital artifacts in (EE). Despite the effectiveness of using different digital artifacts in EE, it is still not a common practice, as indicated earlier, with most educators following traditional teaching approaches. This suggests that there are a number of factors hindering entrepreneurship educators from adopting digital teaching methods. Using technology in EE, such as serious games and designated software, requires training, practice, and continuous development of digital competency, and not all educators may be willing to invest the time and effort to do so.

To summarise, the above section discusses four different types of digital artifacts (pictures, films, serious games, and software) identified in the literature, detailing their characteristics and benefits when used in teaching entrepreneurship education (EE). The mentioned studies

agree that employing various digital artifacts, such as pictures, videos, and serious games, can enhance the practical and effective teaching of entrepreneurship content, a recommended approach in the literature. However, these studies do not delve into the different factors facilitating and impeding entrepreneurship educators in implementing these digital artifacts in EE classes., nor do they present the process of how DA adoption unfolds. Therefore, this study aims to investigate this topic. Additionally, the research seeks to identify the under-researched process of digital artifact adoption in EE. Table 3 below, summarises the key published work on technology and EE. The following section will explore the existing literature on common factors that can facilitate or impede educators from incorporating digital technology into their teaching practices.

Table 3: A summary of key published work on technology adoption and EE

Study focus	Study	Main Findings
Capacity of technology in teaching	Rippa and Secundo (2019)	the paper proposes a novel contribution regarding the emerging concept of Digital Academic Entrepreneurship.
incorporating films in entrepreneurship classes	Liguori, Muldoon and Bendickson (2020)	Films enhances interest and accommodate different learning styles
Learners' engagement through mobile- based teaching	Lim (2017)	Use of technology increase learners' learning experience
Emerging technologies	Lombardi (2019)	Need for more awareness about emerging technologies
Technology & EE	Ratten (2020)	There is a need for more AI in teaching to simulate the real environment.
Technology & EE	Kirk and Rifkin (2020)	technology can play a pivotal role in EE
Teaching Methods in Entrepreneurship	Mavlutova <i>et al.</i> (2020b)	Innovative & practical teaching methods are vital
Teaching Methods in Entrepreneurship	Neck and Greene (2011)	Teaching methods needs to be revised
Learning with Mobile technology	Briz-Ponce <i>et al.</i> (2017)	Learners value interactive & modern learning technologies
Approaches to EE learning	Curtis, Moon and Penaluna (2021)	EE is still inconclusive, and current practice suggests that delivery is still quite passive and traditional.
digital technology and development of learners' entrepreneurial self-efficacy and intentions	Monllor and Soto-Simeone (2020)	Technology has a positive impact on learners' intention.
the current trends in EE	Ratten and Usmanij (2021)	entrepreneurship education needs to further progress in new teaching methods
EE–entrepreneurial intentions relationship	Bae <i>et al.</i> (2014)	use of digital methodologies is increasing in education

Digital Technology Perspective of entrepreneurship	Nambisan (2017)	SLR: entrepreneurship in a digital world and a that calls for the explicit theorizing of concepts related to digital technologies
Using videos to develop entrepreneurial identities	Wraae and Walmsley (2020)	This approach can foster self-awareness & shape entrepreneurial identities
explore current policies and develop a typology that characterizes digital entrepreneurs (DEs)	Ammirato et al. (2020)	The study identifies three main clusters among the DEs: emerging very young; emerging business focused and experienced
Effectiveness of using PowToon, video tool	Wu, Yuan and Pan (2018)	Presentation are more attractive using this tool
Educators' Use of Digital Tools	Amhag, Hellström and Stigmar (2019)	results show that educators do not use digital tools primarily for pedagogical purposes.
digital literacy of educators	Turulja et al. (2020)	Educators' entrepreneurial behaviour positively influences the learners' academic success.
Visual in entrepreneurship classes	Ellborg (2018)	Using visualisation as a platform to express perspectives
Adopting a design approach	Simeone, Secundo and Schiuma (2018)	Findings will show that design can play a relevant role in fostering entrepreneurial activities and value creation in academia
digital competence of educators in Covid times	Núñez-Canal, de Obesso and Pérez-Rivero (2022)	The results show the relevance of educators' characteristics to the learning process concerning previous knowledge about technology, training received, and their attitude toward technology
SG & entrepreneurial behaviour	Ruskovaara and Pihkala (2013)	SG has a positive impact on entrepreneurial behaviour & intentions
Potential of digital technologies in academic entrepreneurship	Oppong, Singh, and Kujur (2020)	the findings show a positive influence on academic entrepreneurs' intentions to use digital technologies media platforms
digital education methodologies	Sousa et al. (2019)	a literature review on e-education
Impact of gamified EE	Grivokostopoulou, Kostas and Perikos (2019)	Gamified learning bridge the gap between theory & practice

Entrepreneurial behaviour & intention	Fellnhofer (2015)	SG can be effective tool in EE
Serious games in entrepreneurship	Isabelle (2020)	Gamifications enhance learners experience
Gamified EE	Dichev and Dicheva (2017)	Use of games in learning can change behaviour
Digital transformation in EE	Lesinskis <i>et al.</i> (2023)	effectiveness of digitalization-based entrepreneurial education in promoting entrepreneurial intention
EE & “Contamination Lab”	Secundo, Rippa, Meoli (2020)	Such labs develop an entrepreneurial mindset
Digital Academic Entrepreneurship	Secundo, Rippa, and Cerchione (2020)	literature on Digital Academic Entrepreneurship is really scant and dominated by unrelated research.
Educating scientists and engineers for technology entrepreneurship in the emerging digital era	Lamine <i>et al.</i> (2021)	Systematic literature review in technology entrepreneurship

2.6 Factors influencing adoption of technology in education

Drawing from current literature, the process of digital artifact adoption unfolds through the amalgamation of various factors. Numerous research papers have highlighted factors that can either facilitate or inhibit the implementation of digital technology in education. Some of these factors are internal, pertaining to educators, while others are external, associated with the surrounding environment, including organisational culture, policies, learners, and technological infrastructure.

According to Alzahrani (2019) despite substantial government spending to support technology adoption in secondary schools in Saudi Arabia, positive outcomes remain elusive. Various barriers hinder successful implementation, including the absence of a common and effective strategy for technology implementation, inadequate technical support, a lack of essential equipment and software in some schools, and the incompatibility of traditional teaching methods with digital alternatives. Additionally, educators often lack sufficient training on how to use and implement digital teaching methods effectively. However, Kocaleva, Stojanovic and Zdravev (2014) argue that, regardless of the benefits of technology in education, its success depends on acceptance and usage by the workforce. Tondeur *et al.* (2017) emphasise that the primary challenge lies in encouraging educators to integrate technology into their teaching practices, given that they typically have the authority to decide whether to adopt technological tools. The subsequent paragraphs will delve into different factors influencing the implementation of technology in teaching practices.

2.6.1 Educator awareness & characteristics (educator's role)

Educators awareness of the importance and benefits of digital technology adoption in teaching is recognized as a pivotal factor that can lead to its actual implementation (Nugroho, Triana and Zulaiha, 2022). The acceptance of technology by educators is crucial in determining the success or failure of any design and application of information technology (Wang *et al.*, 2009). The role of educators in technology integration is imperative, given their direct responsibility for teaching, delivering lessons, and close association with learners in the learning process (Deng *et al.*, 2014; Joo, Park and Lim, 2018; Lawrence and Tar, 2018). In general, there appears to be a lack of awareness regarding the full potential of the digital technology in entrepreneurship (Secundo, Rippa and Meoli, 2020). Amhag, Hellström and Stigmar (2019) study also concludes that educators need to comprehend the potential of digital tools in facilitating education.

Indeed, Al Naibi, Madarsha and Ismail's (2015) research explore the use of Blackboard by teaching staff in the Colleges of Applied Sciences in Oman, highlighting that faculty's unawareness of Blackboard services was one of the reasons for underutilising this facility. In the same vein, Alfarani (2016) paper on Mobile Learning concludes that educators are not fully aware of the benefits of using mobile learning and how to deploy it in their teaching practices. Furthermore, some educators may resist adopting new technology due to lack of knowledge or the risk of leaving the comfort zone, which could be attributed to a lack of motivation to learn new teaching methods (Moerschell, 2009; Núñez-Canal, de Obesso and Pérez-Rivero, 2022). Most educators nowadays may agree that using technology for learning and teaching is beneficial, this alone does not ensure effective use of technology in teaching practices (Teo, 2012); other factors are also important.

2.6.2 Digital competency

Digital competency is a vital factor that for technology adoption in entrepreneurship teaching. Information Communication Technology (ICT) competency refers to the individual's capacity to handle ICT tools for different purposes (Aesaert and Van Braak, 2015) , and studies suggest that ICT competency impacts the adoption of technology. For example, Jegede, Dibu-Ojerinde and Ilori (2007) empirical study reveals a strong relationship between computer competency and attitudes toward computer. Educators need to continuously improve their digital competency, as the use of different digital artifact may require learning a specific application or a programme (Núñez-Canal, de Obesso and Pérez-Rivero, 2022). However, the continuous evolution of technology tools with the creation of new programmes and applications, poses challenges for educators, as they may need to seek ways to adopt what best suits the learners (Amhag, Hellström and Stigmar, 2019). Zainuddin, Rahim and Rejab (2012) recommend that entrepreneurship educators should promptly embrace the latest technology to benefit learners. Implementing such recommendations requires effort from educators, who may encounter various obstacles to do so.

2.6.3 Role of the learners

Several studies have highlighted the significance of learners, including their characteristics, as a pivotal factor in the adoption of technology. Al-Fadhli (2009) study revealed that the implementation and progress of technology also depend on learners' acceptance of it. A

similar result was also found in Selim's (2007) research, emphasising the crucial role of learners' characteristics in the acceptance of technological tools in the learning process. The proper use of digital technology can enhance learners' academic outcomes (Lin, Chen and Liu, 2017). Wang and Chiou's (2020) study aimed to explore the acceptance of Moodle by higher education learners, finding that learners' attitude and perceived usefulness significantly influence their intention to adopt Moodle for learning purposes. Additionally, various studies have demonstrated the positive impact of technology use on learners' results. For instance, researchers observed improved academic performance in exams and quizzes when educators incorporated more digital teaching tools across diverse disciplines such as psychology, operations management, and marketing (Bartsch and Murphy, 2011). Finally, Al-Adwan, Al-Adwan and Smedley's (2013) study revealed that learners are more engaged with user-friendly technologies. In a similar vein, Bag, Aich and Islam's (2022) research established that factors like ease of use, attitude, and perceived usefulness were vital contributors to learners' intention to use an online education system. Therefore, recognising the positive role of learners in accepting and utilising technology is paramount in shaping effective teaching and learning practices.

2.6.4 Role of management

The role of education institutions in the integration of technology into teaching is pivotal. This is achieved by providing various conditions such as clear policies, support, proper infrastructure and training. Núñez-Canal, de Obesso and Pérez-Rivero (2022) emphasised that colleges and universities management should actively contribute to digital transformation. Studies have shown that proper encouragement and support from institutional management are vital factors in adopting technology in teaching (Ismail, 2010; Wong, Russo and McDowall, 2012). Management's awareness of the importance of technology in teaching can be reflected in providing the necessary infrastructure, including equipment and training, and in implementing policies that insist on the adoption of technology in teaching (Alkharang and Ghinea, 2013). Providing up-to-date technological infrastructure, including hardware and software, is undoubtedly crucial for technology diffusion, given the non-stop nature of technological changes (Gülbahar, 2007). In practice, academic institutions may not be willing to invest extensively in infrastructure; however, 'adequate' infrastructure is the foundation for technology adoption. Therefore, Núñez-Canal, de Obesso and Pérez-Rivero (2022) paper suggest exploring how higher education institutions approach the development of digital competency among their staff.

2.6.5 Educator training

As emerging technologies appear, there is a need to train educators on how to use them effectively. Educators should receive training on the specific technologies intended for use, as some educational organisations may wish to emphasise particular skills, making training a vital component. Alkanani (2012) found that educators refrain from using technology in teaching due to inadequate training, and Bingimlas (2010) revealed that poor training of primary school educators and supervisors was a contributing factor to the ineffective use of technology in teaching. Meanwhile Koehler, Mishra and Cain (2013) argue that educators are often provided with insufficient training. Therefore, providing effective training ensures that educators feel confident in using the intended technology in teaching practices.

2.6.6 Educator workload

A number of studies have revealed that excess workload can influence educators' acceptance and use of technology in teaching. According to Amadi and Eze (2019), educators' excessive workload has hindered the effective delivery of entrepreneurship education. In the same vein, Samarawickrema and Stacey (2007) found that a heavy workload is a significant hindrance for higher education educators in learning how to teach with technology. Tasks such as course maintenance, handling learners' emails, learning and practicing new technological skills, preparation time, marking, along with administrative duties, all contribute to a heavy workload for educators. All study participants expressed concerns about the substantial workload they bear. Workload as a hindrance was also reported in Neyland's (2011) study. Furthermore, Abuhmaid (2011) study reported a similar issue among Jordanian school teachers, with one teacher stating that "teachers are overloaded to learn, prepare and practice what they learn" (p.12). Nevertheless, workload was not identified as a factor impacting educators' utilisation of Interactive Whiteboards (IWBs) in their teaching (Cheng, 2020). Nicolle and Lou's (2008) paper also reveals that lack of time for designing digital materials is a primary reason for not adopting digital technology in teaching. Faculty members are fully loaded with various responsibilities, making it challenging for them to invest time in learning about new technologies.

2.6.7 Entrepreneurship educator educational background

Having the proper qualifications and training is a key factor that encourages educators to adopt digital teaching methods. Entrepreneurship educators are expected to possess specific academic qualifications and/or undergo professional training to effectively teach entrepreneurship. This ensures that they have entrepreneurial competencies and a positive attitude towards entrepreneurship (Peltonen, 2008). Research by Iwu *et al.* (2021) provides an empirical evidence that the competency of the entrepreneurship educator plays a vital role in fostering entrepreneurial intention among learners. Additionally, the study by Liu and Zhu (2019) highlights that some entrepreneurship educators exhibit weak professional competency, impacting the learning experience for students studying entrepreneurship.

In Nigeria, many entrepreneurship educators, primarily from other majors such as business administration and economics, lack both 'entrepreneurial consciousness' and proper entrepreneurship qualifications. This deficiency has been identified as a factor affecting the quality of entrepreneurship in Nigerian Universities (Agbonlahor, 2016). In the teaching of entrepreneurship, topics such as innovation and creativity are crucial. However, if educators fail to apply these concepts in their teaching practices, it may negatively influence students' perceptions of entrepreneurship. Possessing proper qualifications equips educators to effectively teach these modules in a way that motivates entrepreneurial intention among learners. In the Oman context, a study by Al-shabibi (2020) revealed that a significant number of entrepreneurship educators lack qualifications related to entrepreneurship. This deficiency might contribute to the prevalence of traditional teaching methods among these educators. Therefore, as suggested by Joensuu-Salo *et al.* (2021), examining educators' educational backgrounds is essential, as it can impact their teaching methods and, consequently, the effectiveness of entrepreneurship education.

2.6.8 Education Policy

Education Policy (EP) is considered to be one of the main vital aspects of each country's government agenda, as education is given a high priority, and governments concentrate on education policy implications and outcomes for citizens' and economic welfare (Zalah, 2018). According to UNESCO (2004), "Introducing change into a system is relatively easy; ensuring that change flows from policy to the classroom is a formidable challenge" (p.19) cited by (Robertson and Al-Zahrani, 2012). Technology integration and adoption in educational models does not happen 'overnight' (Robertson and Al-Zahrani, 2012). There is a need to follow up and assess the implementation process. According to Haddad and Demsky(1995) and Madge

(2007), there are a number of steps that should be followed for forming effective information technology policies. For example, in the UK, the Department for Education and Skills, in its five-year e-strategy, identifies four key objectives to ensure the adoption and application of information and communication technology (ICT) in education (Smith, Rudd and Coghlan, 2008). Education policy covers wide range of topics related to education such as cultural, political, technical, and organisational matters, which cover policies about technology usage in teaching. In the education sector, policymakers have to consider issues like information technology (IT) infrastructure, course copyright, computer network, acceptable computer usage, digital devices and data, and IT security and privacy. One important aspect of education policy is training, which can include the improvement of digital technology resources and their proper usage. Providing the infrastructure and paying for the subscription is not enough to guarantee effective usage and adoption of technology. There needs to be proper training on how to use them, and also may need to find the factors that may influence educators from using them, if any (Khan Shahadat Hossain, 2014; Zalah, 2018).

There are a number of papers that have highlighted the importance of policies in digital technology adoption in education. For instance, Gamdi and Samarji (2016) study investigates the barriers that hinder Saudi higher education faculty members from adopting e-learning. The paper reveals that most of the barriers are external factors such as poor internet access, lack of technical support, and lack of institutional policy for e-learning; and the writer suggests that there is a need for strategic/ institutional policies to overcome the barriers. Therefore, a clear policy will ensure that educators adopt the available technology.

To summarise, the above-mentioned studies have highlighted that there are several factors that can impact the process of technology adoption in teaching, such as educator awareness, digital competency, workload, educators' qualifications and training. It would be interesting to see if entrepreneurship educators in Oman's face such challenges hindering them from adopting more digital teaching. Such factors could be a reason for not incorporating more digital methods and could be a reason for using the traditional learning style. The following section will review the literature on different theories and models that have been empirically used to investigate technology adoption.

2.7 Review of Technology Acceptance and Adoption Theories

The current literature demonstrates that scholars have shed light on various factors influencing users' intention towards the acceptance and adoption of digital technology, employing different theories and models. It can be noted that a majority of research papers tend to utilise the Theory of Planned Behaviour (TPB) or the Theory of Reasoned Action (TRA) when focusing on intention. However, when the research centres on intention in relation to the adoption of technology, the Technology Acceptance Model (TAM) or the Unified Theory of Acceptance and Use of Technology (UTAUT) is commonly applied. It's worth mentioning that all these theories and models are interconnected, as will be explored later. A brief overview of each theory is provided below, with a greater emphasis on TAM and UTAUT, given their widespread usage.

2.7.1 Theory of Reasoned Action

Theory of Reasoned Action (TRA) Ajzen and Fishbein (1980) is one of the early theories aimed at explaining the process of decision-making of individuals on a certain behaviour, as the theory focuses more on and provide insightful concepts about behaviour (Fishbein and Ajzen, 1975). The underlying hypothesis of the theory is that individuals typically consider the implications of their actions before making decisions or engaging in specific behaviours (Ajzen and Fishbein, 1980). The theory posits that individuals' behaviour is driven by their intentions to perform a certain behaviour, termed Behavioural Intention (BI). BI is jointly determined by two factors: Attitudes to Behaviours, and subjective norms ($BI = A + SN$). Attitudes to Behaviours denotes an individual's positive or negative feelings towards a particular behaviour, while subjective norms refer to an individual's perception of the importance of people around them in influencing the decision to perform or not perform the behaviour (see Figure 2) (Fishbein and Ajzen, 1975). Therefore, the theory states that if a person intends to engage in a behaviour, they are likely to do so.

According to Venkatesh *et al.* (2003), TRA is considered one of the most suitable theories for measuring individual behaviour, and some research papers have applied it to investigate educators' behaviour in technology adoption (e.g. Shah Alam *et al.*, 2012). However, TRA has its limitations. If attitudes and intentions do not align with action, considering factors such as time, context, and target, the TRA model may not be applicable. Constraints like time, environmental factors, and limited ability can restrict the freedom to perform the behaviour (Sheppard, Hartwick and Warshaw, 1988). Furthermore, the theory can provide only partial

explanations of behaviour. Therefore, modification and extension of the theory are inevitable to enhance our understanding of behaviour (Hagger, 2019).

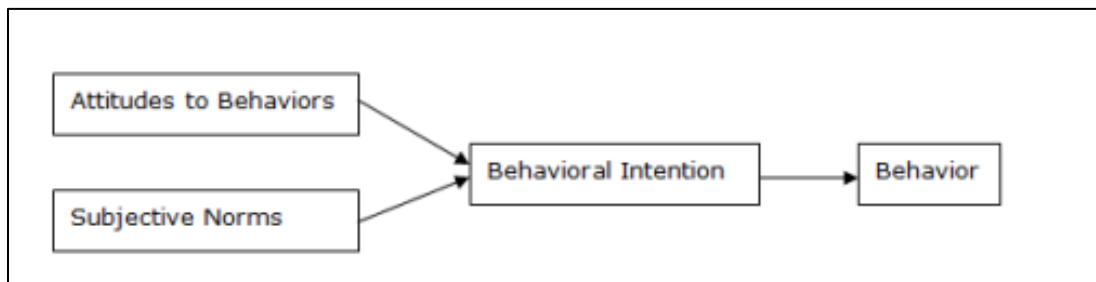


Figure 2: Theory of Reasoned Action

2.7.2 Theory of Planned Behaviour

Theory of Planned Behaviour (TPB), proposed by Ajzen (1991), is an extension of TRA theory and aims to address its shortcomings. In this theory, an individual's intention to engage in a specific behaviour is a key aspect. Intentions serve as measures of how determined individuals are to perform a certain behaviour; therefore, the more resolute the intention, the more likely the behaviour will be performed. The theory comprises three main constructs, as depicted in Figure 3 below, which are attitude towards the behaviour and subjective norms (similar to TRA), with the extension of perceived behavioural control. These constructs collectively form the individual's intention, ultimately influencing actual behaviour (Ajzen, 1991), as depicted in Figure 3. Perceived behavioural control is defined as 'people's perception of the ease or difficulty of performing the behaviour of interest' (Ajzen, 1991, p.183).

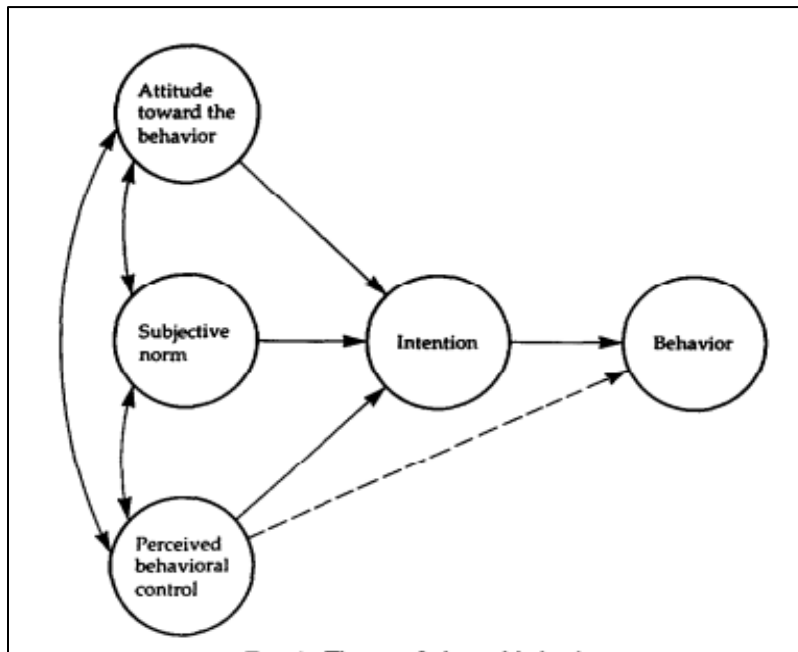


Figure 3: Theory of Planned Behaviour

A number of studies that have been conducted to validate its effectiveness, to predict behaviour and intention, in many research areas, as in information system (Mathieson, 1991; Yousafzai, Foxall and Pallister, 2010), healthcare (Chau and Hu, 2002; Korteisto *et al.*, 2010), and entrepreneurial intention (Van Gelderen, Kautonen and Fink, 2015; Jena, 2020). Also, a study by Teo and Lee (2010) of 157 student teachers, revealed that the TPB was an effective model, by explaining 40% of the variance in the sample's intention to adopt technology.

Despite the popularity and its effectiveness, TPB faces a number of limitations. One, according to Eagly and Chaiken (1993), there are other factors that could impact in predicting intention and behaviour, such as habit and self-identity, which are not considered in the current model. Second, TPB is a general theory that lacks vital constructs related to technology adoption. Critics have questioned its applicability in the field of technology adoption, as the theory omits factors like ICT literacy, perceived usefulness, perceived risk, and habit (Ajzen, 1991; Chen, Chen and Chen, 2009; Yousafzai, Foxall and Pallister, 2010; Venkatesh, Thnog and Xu, 2012; Oraini, 2014). Given that this research focuses on technology adoption, the Theory of Planned Behaviour does not appear to be applicable as a theoretical lens.

Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) have been the most commonly used models in technology adoption studies. The following section will describe each model and then outline the limitations of these models.

2.7.3 Technology Acceptance Model

Technology Acceptance Model (TAM), is also adapted from TRA, and introduced by (Davis, 1986). The model has been extensively used to explain individuals' acceptance and adoption of new technologies. TAM identifies individuals' behavioural intention to use and accept specific technology, determined by two constructs: Perceived Usefulness and Perceived Ease of Use (Davis, Bagozzi and Warshaw, 1989) , as depicted in Figure 4 below. Perceived Usefulness represents the degree to which a user believes that using a new system would enhance job performance, and Perceived Ease of Use refers to the degree to which a user believes that using a specific system would not require an increased effort. Davis also emphasises that Perceived Ease of Use has a direct significant effort on perceived usefulness, justifying that an easy to use system will increase job performance of the end user. TAM introduces "External Variables" that can impact Perceived Ease of Use and Perceived Usefulness; however, these external variables are not specifically defined.

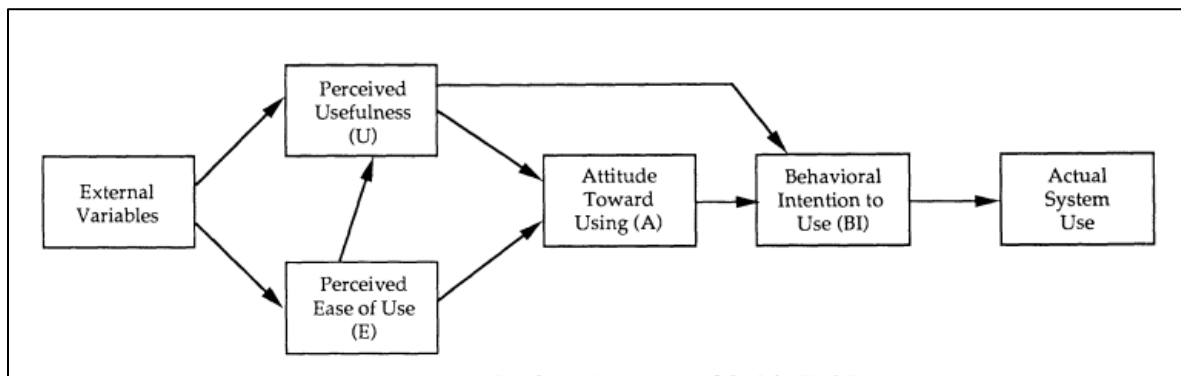


Figure 4: Technology Acceptance Model (TAM)

A number of studies have utilised TAM as a lens to examine technology adoption. For example, Mustofa *et al.* (2022) research assessed the level of acceptance of 396 educators using movie scenes for economics learning media. The outcomes indicated a strong connection in all direct and indirect effects studied. The research also highlights that Perceived Ease of Use of the learning media (movie scene) has the largest effect on the construct, recognised as highly predictive in relation to Behavioural intention to use. The researchers emphasised that, for the adoption of a certain technology, learning media developers and policymakers should consider teachers' perceptions of ease of use, as they are the main users. To account for cultural differences in technology adoption, Teo *et al.* (2009) examined pre-service teachers' future intention to use technology in teaching in Malaysia and Singapore. A survey distributed to 495 teachers revealed differences in intention and attitudes towards

computer use, with Malaysian teachers having more positive attitudes, possibly due to perceiving computers as useful and easy to use. Sánchez and Hueros (2010) claim that TAM is the most suitable model to predict the users' intention towards the use of new technology, a conclusion supported by previous studies, as (Gefen, Karahanna, 2003; Wu and Chen, 2005).

While TAM has been extensively used and studies have supported its validity for different educator groups in explaining the adoption of technology, some findings regarding the model have been contradictory. For example, some research papers reveal a significant influence of perceived usefulness on behavioural intentions, others did not (e.g. Teo *et al.*, 2011; Mac Callum, Jeffrey and Kinshuk, 2014). Additionally, the model's predication of 30% to 40% technology acceptance indicates a limited explanatory power and limited usefulness in understanding technology acceptance (Venkatesh and Davis, 2000; Bagozzi, 2007; Benbasat and Barki, 2007). Furthermore, the impact of social influence on individual behaviour is vital, but the model lacks considering it (Chen, Chen and Chen, 2009). It has also been argued that beliefs and attitudes about certain technology are influenced by factors beyond just the two constructs, perceived usefulness and perceived ease of use (Straub, 2009). Lastly, though TAM focuses on technology adoption, it does not specify external variables that can impact on individuals' technology acceptance and use, providing only general information regarding the adoption and acceptance of a specific technology (Tsai, 2015). Factors such as prior experience, age, gender, and other characteristics may influence attitudes and intentions toward technology adoption; however, the model does not take them into consideration (Straub, 2009). TAM overlooks personal and organisational factors that can influence technology adoption (Davis, 1989; Moon and Kim, 2001; Ward, 2013; Chang *et al.*, 2015). As a result of these weakness, the Unified Theory of Acceptance and Use of Technology (UTAUT) model was created.

2.7.4 Unified Theory of Acceptance and Use of Technology (UTAUT)

The model was established by Venkatesh and colleagues in 2003, after testing and comparing eight theories are as follows: 1. the theory of planned behaviour (TPB), 2. theory of reasoned action (TRA), 3. technology acceptance model (TAM), 4. innovation diffusion theory (IDT), 5. Social Cognitive Theory (SCT), 6 & 7. the Model of PC Utilization (MPCU), combined from TPB/TAM, and 8. the Motivational Model (MM) (Venkatesh *et al.*, 2003). There are four main constructs of the theory: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). According to the theory, the first three constructs (PE, SI, and EE) directly determine Behavioural Intention (BI) to use a particular

technology, which, in turn, leads to Usage behaviour. Meanwhile, the fourth construct (FC) directly influences Usage behaviour. These four elements are also subject to the influence of four moderators: age, gender, experience, and voluntariness, as depicted in Figure 5 below. The following sections present further details about each construct of the model.

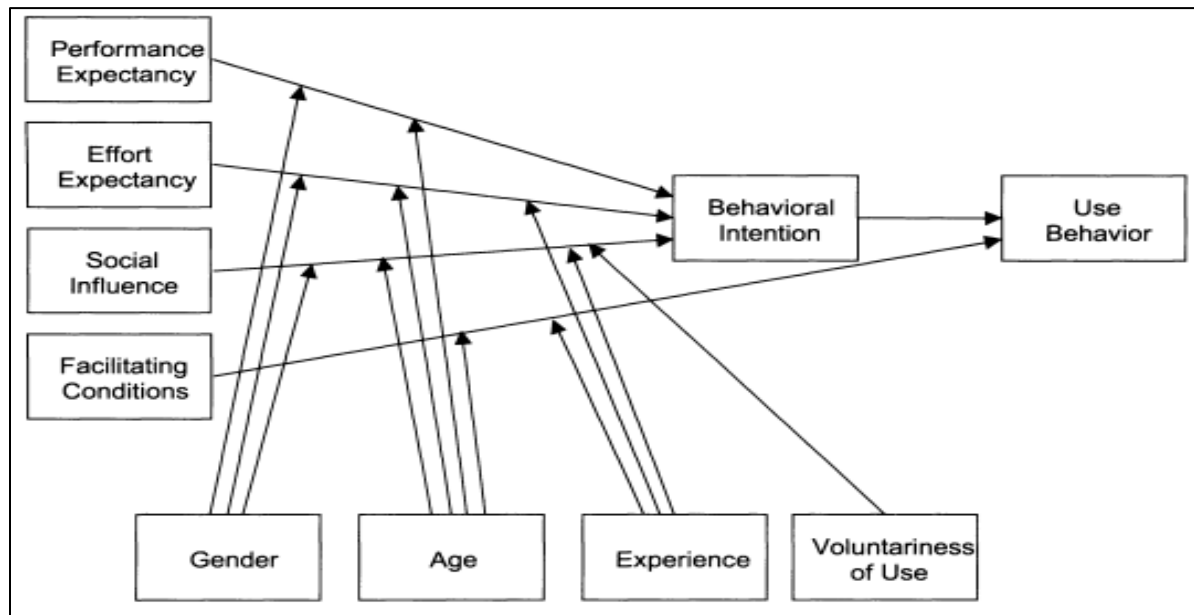


Figure 5: Unified theory of acceptance and use of technology (Venkatesh et al., 2003)

Performance Expectancy (PE) is defined as the percentage an individual believes that using a specific system will help in getting the job done (Venkatesh *et al.*, 2003). It reflects the expectation that the use of a particular technology will provide various advantages to users throughout the process of performing a specific activity. This main construct encompasses five minor constructs, all derived from other models and theories: perceived usefulness, relative advantage, extrinsic motivation, outcome expectations, and job-fit. According to Venkatesh *et al.* (2003), PE is the strongest predictor of intention, whether the adoption of technology is mandatory or voluntary. PE has proven to be the most crucial forecaster of behavioural intention and one of the most important factors in determining the acceptance level. This is because users typically predict the degree of benefit to be gained from a specific technology (Zalah, 2018).

In a review conducted by Momani and Abualkishik (2014) on 11 models to identify factors impacting the intention to adopt mobile blackboard, they found that the constructs used by UTAUT were the most widely employed in these studies. Their research further indicated that Performance Expectancy (PE) was the primary influential factor across the studies. Similarly, Pullen *et al.* (2015) investigated the use of technology in learning among a group of Malaysian

first-year pre-service educators. The study's outcomes revealed that PE was one of the significant factors determining their intention to use digital technology for learning purposes.

Effort Expectancy refers to the degree of ease of the system (Venkatesh *et al.*, 2003). In an educational context, effort expectancy is identified as the degree to which users believe that a digital system is easy to use (Lowenthal, 2010). Digital technologies that are perceived as easy to use are more likely to be used and adopted (Zalah, 2018). Tosuntaş, Karadağ and Orhan (2015) research aimed to explore the factors influencing secondary school teachers' acceptance and use of interactive whiteboards in Turkey, employing a survey of 158 respondents using UTAUT model. The outcome revealed that effort expectancy has a positive impact on behavioural intention to use the whiteboards. This findings corroborate with (Venkatesh *et al.*, 2003; Moran, Hawkes and El Gayar, 2010; Wong, Russo and Mcdowall, 2012). Generally, educators are more likely to use a digital equipment that they find easy and user-friendly. This has implications for colleges and universities management, emphasising that educators' opinions on deciding a specific technology to be adopted are vital. The literature has revealed that effort expectancy is a crucial factor in determining whether users intend to use a specific digital technology or not.

Social Influence (SI) measures the extent to which an individual perceives that important people or influencers in the organisation believe that he or she should adopt the new system (Venkatesh *et al.*, 2003). This main construct encompasses three minor constructs: subjective norm, social factors, and image, all derived from other theories and models. Bere (2014) emphasises that all these constructs share the idea that others' attitudes can influence someone's behaviour, and educational technology is no exception. Prior research has confirmed the validity of social influence in impacting a person's intention to use technology for learning (Brown, Dennis and Venkatesh, 2010; Göğüş, Nistor and Lerche, 2012). Thus, social influence can be a vital factor in terms of adopting a specific technology.

Facilitating conditions (FC) refers to the degree to which an individual believe that the required organisational and technical infrastructure is available to implement the system (Venkatesh *et al.*, 2003). Facilitating conditions encompass various elements, including the availability of guidance, instructions, and assistance to implement a digital system (Venkatesh *et al.*, 2003). This may also involve having access to Internet, personal computers (PC), projectors, applications, and software necessary for system implementation. Additionally, technical support, such as the availability of training or technicians when required, falls under facilitating conditions. According to Alkhasawneh and Alanazy's (2015) study of technology acceptance among teaching staff at Aljouf University in Saudi Arabia, they revealed that FC has a positive

relation to behavioural intention. Staff who perceived the organisational and technical infrastructure as adequate to support the system were more likely to state that they would use it.

There are other studies that have applied the UTAUT model in an educational context. For instance, in his study on the factors that influence Saudi Secondary school teachers' adoption of e-learning technologies, Zalah (2018) found that lack of clarity and proper implementation of education policies, teachers anxieties about having the adequate skills, and the absence of management support affected their intentions to accept and use e-learning in their teaching practices. Other factors, such as insufficient educational experience and training, were also hindrances to the actual use of e-learning in Saudi secondary school teaching. Moreover, Cheng (2020) study, investigating the factors influencing educators in using Interactive Whiteboards (IWBs), reveals that Perform Expectancy (PE), Effort Expectancy (EE) and Facilitating Conditions (FC) are the main factors impacting their decision to use the IWBs.

The UTAUT model is employed to elucidate the reasons why individuals generally decide to adopt/use or choose to reject an information technology tool (Gruzd, Staves and Wilk, 2012). Numerous studies have tested the model with its four main constructs, and other studies have also revised the model incorporating additional constructs to suit their specific studies, investigating whether these additions impact the adoption of the technology under examination. For instance, Nawi *et al.* (2017) explored learners' entrepreneurs' adoption of social media, Oppong, Singh and Kujur (2020) investigated the opportunities and challenges academic entrepreneurs face when adopting social media technology, and Leow, Phua and Teh (2021) use UTAUT model to study the social influence factor.

Nonetheless, the UTAUT model has also faced criticism. Williams *et al.* (2011) in the literature review, discovered that the model relies excessively on TAM, despite its claim to be derived from eight models and theories. The paper further highlights that, although many studies profess to use the UTAUT model, only a few genuinely incorporate the theory or its constructs in their empirical papers. The model faced additional critique from van Raaij and Schepers (2008) asserting that achieving the model's effectiveness requires the moderation of relationships among the four variables with factors like gender, age, experience, and voluntariness to yield more significant coefficients. This makes the model less parsimonious than TAM. Furthermore, the constructs of facilitating condition and social influence also received criticism. It was noted that facilitating condition is problematic as it combines a diverse array of items that cannot be unified under a single psychometric construct. This construct encompasses items such as technology, resources, and assistance, amalgamating

items that align with an individual's work style and technology (van Raaij and Schepers, 2008). Similarly, van Raaij and Schepers argue that the social influence construct merges items related to a person's perception of others thinking they should use the new technology (subjective norm), the belief that others support using new technology (social factors), and the perception that those using the technology have higher social status (image). They further argued that such disparate items cannot adequately represent the same construct.

2.7.5 Limitations of TAM and UTAUT in explaining digital technology adoption process

While TAM and UTAUT models have been extensively used in technology adoption research, they possess limitations. Primarily designed to investigate technology adoption behaviour, these models focus on behavioural factors as triggers for adoption. However, tangible or non-behavioural factors, as discussed in the previous section, are equally crucial for understanding technology adoption. Although TAM and UTAUT include external variables, they lack specificity in identifying tangible elements. For instance, in TAM model, perceived usefulness and perceived ease of use are standalone variables, lacking tangible elements. While the models introduce external variables, they do not specify particular tangible variables. UTAUT model also combine different items in one construct.

Furthermore, while TAM and UTAUT effectively explain aspects of technology adoption, they do not elucidate the process of technology adoption unfolding over time. Understanding how constructs correlate and form the adoption process is crucial. Here, 'process' refers to a sequence of events explaining how and why things change over time (van de Ven, 1992). It is insufficient to merely identify the different constructs leading to technology adoption; understanding how these constructs correlate and form the process of technology adoption is equally crucial. Therefore, exploring the topic from a different perspective may yield additional insights into the factors that can facilitate or hinder technology adoption. The process of digital technology adoption has received less attention (Aldunate and Nussbaum, 2013), and a process-oriented approach will illuminate how the phenomenon of technology adoption unfolds over time. Consequently, this research will investigate the process of digital artifact adoption with an emphasis on experiential learning, using grounded theory. The following section will discuss variance and process approaches.

2.8 A process approach to theory

According to Mohr (1983), there are two distinct approaches to theory in the social sciences: variance theories and process theories. The primary difference between the two lies in the angle of explanation. Variance theories seek to justify the change in a dependent variable caused by an independent variable, while process theories explain how a phenomenon occurs by describing the sequence of events. Therefore, the key distinction between the approaches is the perspective of explanation. Scholars adopting a variance approach view the world as consisting of variables (Mohr, 1983), with the goal of testing the impact between these variables (Poole *et al.*, 2000). Studies employing a variance approach aim to explain and/or predict whether and to what extent certain variables will change and whether this change will impact other variables (Van De Ven and Poole, 2005). This approach is generally well-suited for experiments and survey research, as they can be tested using common statistical methods such as ANOVA, regression, and factor analysis (Van de Ven and Poole, 2005).

One vital weakness of variance theories is that they are not applicable in capturing dynamic phenomena. Studies adopting the variance approach tend to overlook how entities change over time, leaving them unable to provide a complete picture of the world (Tsoukas and Hatch, 2001). Hence, such an approach is not adequate for justifying phenomena that involve development and change (Poole *et al.*, 2000). While the approach is applicable to identify relationships with phenomena, it is not suitable for offering a solid embedded explanation of how such relationships occurred (Langley, 2007), which can result in missing a vital part of understanding how the phenomena unfold (van de Ven, 1992). Thus, variance theories are not the best for explaining the change and development of a certain phenomenon (Poole *et al.*, 2000).

On the other side, researchers who embrace a process approach aim to explicate how change has occurred by describing the sequence of events related to the cause and effect (Pentland, 1999). This approach can be more complicated due to the complexity of events, different time scales in the same process, and the dynamic nature of the process (Van De Ven and Poole, 2005). However, the process approach is more capable of explaining aspects of change and the development of phenomena over time (Van De Ven and Poole, 2005). According to Mackenzie (2000), a process contains five distinct components: the people/entities, the different elements, the relationship between every pair of elements, the relationship to other processes, and the resources involved with each step.

The literature discerns three distinct usages of the term 'process' (van de Ven, 1992):

1. A process denotes a logic that explains a causal relationship between independent and dependent variables.
2. It can also signify a category of concepts or variables that allude to the actions of organizations or individuals.
3. A process represents a sequence of events elucidating how and why things change over time.

The first meaning of the concept centres on logic, aiming to elucidate the causal relationship between two variables by observing inputs and outputs in a variance theory (Mohr, 1983). In this case, the goal is to explain why an independent variable exerts a causal impact on a dependent variable. However, in this process, the sequence is not directly observed, leading to an unexplained relation between an input and output, thereby restricting an explanation of how the order and sequence of events unfold (van de Ven, 1992).

The second meaning of 'process'—a category of concepts—refers to actions performed by individuals or organisations, such as workflows, corporate venturing, and decision making. In this context, 'process' serves as a distinct conceptual category, setting itself apart from other classifications like organisational environment, structure, and performance. Similar to these aforementioned categories, concepts related to processes are operationalised as constructs and quantified as fixed entities (variables), with attributes exhibiting variations along numerical scales ranging from low to high. In this approach, researchers can only observe whether a process variable has changed as time passes, without gaining insight into how the change occurred. This meaning of 'process' is the most frequently used in the concept (van de Ven, 1992).

The third meaning of 'process' refers to a narrative describing how events develop and change. In this context, the process embraces a historical developmental perspective, focusing on the sequence of activities, incidents, and stages that unfold over the period of the phenomenon being investigated (van de Ven, 1992). Researchers examine the process and thereby create a narrative explaining how a change occurred over time (van de Ven, 1992).

Defining a process as a sequence of events, a process approach to theory refers to an explanation of how and why entities change (Van De Ven and Poole, 2005). Events encompass what subjects do or what happens to them, carrying the significance of explaining development and change (Van de Ven and Engleman, 2004). Change can refer to the

observation of how events, forms, states, or cycles differ over time, and process theories aim to explain change by describing the progression of events connecting the causes to effects (Pentland, 1999; Van De Ven and Poole, 2005). As such, process approaches tend to be more complicated than variance approaches because they incorporate different factors influencing the intended change, such as events, sequences of events, steps, and relationships between steps and entities (Mackenzie, 2000; Van De Ven and Poole, 2005). This study aims to investigate the process of digital artifacts adoption in entrepreneurship education, looking at the different elements of process such as events, change, and sequence of events.

While previous studies investigating the use of various digital artifacts in entrepreneurship education have examined different factors supporting technology adoption, they have overlooked the process of DA adoption. Studying the process provides an explanation of how a certain phenomenon develop and evolve overtime. Therefore, this study aims to fill this gap by exploring the process of digital artifacts adoption in entrepreneurship education. Additionally, it proposes a framework to illustrate the DA adoption process. To bridge this gap and explore the process of DA adoption in EE, this study conceives "process" as a sequence of events explaining change through successive stages, referring to the unfolding of events and actions over time (van de Ven, 1992), referring to the third meaning of process. It aims to describe the narrative of how certain subjects change and develop (van de Ven and Poole, 1995). Therefore, this PhD study addresses the following research questions:

“How does the process of digital artifact adoption unfold for entrepreneurship educators?”

The main question would be answered through 3 sub-questions:

1. What factors facilitate the adoption of DA in EE teaching practices?
2. What factors impede the adoption of DA in EE teaching practices?
3. What strategies do entrepreneurship educators implement to overcome the impeding factors

Chapter 3: Methodology

3.1 Introduction

In the previous chapter, I presented the literature review related to technology adoption in entrepreneurship education and identified a gap in the literature, which is the limited research on the process of how technology adoption unfolds over time. Hence, this research will contribute by presenting the process of technology adoption in entrepreneurship education. The main question that guides this study is, "How does the process of digital artifact adoption unfold for entrepreneurship educators?"

This chapter outlines the methodological approach carried out to address the current study's aims and objectives and answers the research question outlined above. The chapter begins with an overview of the two research paradigms, interpretivism, and positivism, and explains the rationale for choosing a qualitative approach design. Then I move on to discuss the data collection process by highlighting the sampling and interview techniques. Next, the ethical considerations of this research are indicated, and the chapter ends with detailed section of the data analysis process to generate the data structure.

3.2 Research Paradigm and Design

As this research intends to explore and answer the research question regarding the process of adoption of digital artifacts in entrepreneurship education, the qualitative, inductive approach based on grounded theory is deemed more appropriate. Qualitative research has been associated with interpretivism, an epistemological research orientation strategy (Bryman and Bell, 2015).

"Interpretivism is a contrasting epistemology to positivism" (Bryman and Bell, 2015.p.28), where positivism rests on the assumption that social reality is singular and objective, and therefore, it is not affected by investigation; interpretivism assumes that social reality is in our minds, subjective, and can be multiple, and hence, the act of investigation can affect it (Collis and Hussey, 2014). Generally, the positivist approach to social sciences leans towards explaining human behaviour, whereas the interpretivist is concerned with understanding human behaviour (Bryman and Bell, 2015). Since the former approach believes that social phenomena can be measured, it has been linked with quantitative research that uses

statistical analysis. Interpretivism research involves an inductive process that aims to offer an interpretive understanding of the studied social phenomena within a specific context (Collis and Hussey, 2014), as in the case of this study, where the process of technology adoption needs to be explored, understood, and interpreted since there is a paucity of literature about the current topic. Therefore, exploratory qualitative research is appropriate and will be applied in this research.

Qualitative research is conducted when a problem or an issue needs to be understood and explored (Creswell and Poth, 2018). Investigating the process of technology adoption in entrepreneurship education is an under-researched topic, and therefore, exploring areas that have not been thoroughly researched is one of the reasons for using the qualitative method (Corbin and Strauss, 2015). Qualitative research offers detailed, rich, and holistic information that can reveal the complexity of the phenomena being studied. Thus, it provides the researcher with “thick description” by offering details about people, process, and activities, which can also create a strong impact on the reader (Wertz *et al.*, 2011; Tracy, 2013; Miles, Huberman and Saldaña, 2014). Also, unlike quantitative research, qualitative research predominantly emphasises the meaning of words and offers rich descriptions of situations and context, leading to new understanding/ theory (Bryman, 2012). Similarly, in process theory, a narrative describes a sequence of events on how change unfolds overtime, using words and description to produce a given outcome. This fits the qualitative approach, which is about explaining and describing events (Van De Ven and Poole, 2005). A qualitative approach as a research strategy usually emphasises the use of words and non-numerical data in the process of data collection and analysis. Moreover, as this research explores the process of technology adoption, the currently available theories do not adequately capture the complexity of the phenomena under investigation. Therefore, applying qualitative methodology to study the process of technology adoption would lead to the creation of a new theory to explain the phenomenon, which is how the process of technology adoption in entrepreneurship education unfolds over time.

Glaser and Strauss (1967) developed grounded theory, one of the forms of qualitative research. Grounded theory is a method of data analysis that is commonly used to build a theory based on empirical evidence. It also enables the identification of general concepts that lead to the development of theoretical explanations, providing new insights into the phenomenon being studied (Corbin and Strauss, 2015). Grounded theory is a theory-development method where theory is derived from the data obtained during the research process, not chosen prior to the beginning of the research. This approach is applicable when the phenomenon being studied is unknown, and the main concepts, as well as the

relationships between the concepts, are not well identified or understood (Corbin and Strauss, 1990). This case is applicable to the current study of the adoption of digital artifact in entrepreneurship education, where the different factors that facilitate and hinder the adoption of digital artifacts in entrepreneurship education teaching practises and how the process of adoption unfolds over time remain unexplored. Hence, this research implements a grounded theory approach.

While Oman's Vision 2040 prioritises entrepreneurship and a knowledge-based economy, the integration of technology in entrepreneurship education remains notably underdeveloped. Despite the recognition of digital skills as essential for entrepreneurial success, current teaching methods predominantly rely on traditional, lecture-based approaches (Al-shabibi, 2020). This reliance on outdated pedagogies may hinder students' ability to develop the critical thinking, problem-solving, and innovation skills necessary for entrepreneurial endeavors. Moreover, the paucity of research on technology adoption in Omani entrepreneurship education underscores the need for comprehensive investigations into effective technology integration strategies.

In the context of the study, entrepreneurship education is a mandatory subject in higher education institutions; however, the qualifications required to teach it differ significantly from those of other subjects. Specifically, educators teaching entrepreneurship are not required to have specialised training or qualifications, unlike their counterparts in fields like marketing or accounting. This discrepancy may reflect the perception of entrepreneurship by higher education institutions' management. Additionally, entrepreneurship is typically a standalone module that may not be directly related to learners' degree programmes. However, policymakers aim to impart essential skills through this course. Furthermore, entrepreneurship education differs from other disciplines in its emphasis on practical application, creativity and innovation (Heinonen and Poikkijoki, 2006; Charrón Vías and Rivera-Cruz, 2020) , creating and operating an enterprise and problem-solving (Wei, Liu and Sha, 2019), rather than solely theoretical knowledge. In addition, unlike graduates from other fields who typically seek employment, those with entrepreneurship qualifications often aspire to business ownership, driven by the skills and knowledge acquired through their coursework. This notion was found in a number of studies such as in (Upton, Sexton and Moore, 1995; Kolvereid and Moen, 1997; Katz, 2003; Din, Anuar and Usman, 2016; Decker-Lange *et al.*, 2020). While learners who are hired by organisations (at a later stage) have access to supervision and guidance, those who choose to start their own businesses may lack such support (Hameed and Irfan, 2019). These factors, combined with the dynamic and rapidly changing entrepreneurial landscape, distinguish entrepreneurship education from more established fields.

Consequently, effective entrepreneurship education programs can have a significant impact on learners, with implications for their future success. Hence, this research posits that using DA in teaching entrepreneurship can yield positive impact on the learners. Yet, identifying the process of DA adoption in entrepreneurship education is the ultimate goal of this research, by applying grounded theory approach. Grounded theory, as emphasised by Corbin and Strauss (2015), offers explanation of change situations and enables to examine topics from multiple perspectives to develop comprehensive explanation. Therefore, grounded theory will be employed in this study to investigate the phenomenon.

3.3. Sampling and data collection

To recruit participants for this qualitative study, a theoretical sampling approach was followed, with entrepreneurship educators as the main target sample. Theoretical sampling is a particular form of purposive sampling (Saunders, Lewis and Thornhill, 2012). Purposive sampling is applied in qualitative research, where researchers apply their judgment in selecting the relevant participants that will best be able to answer the study's research questions and meet the objective of the study (Bryman, 2012; Saunders, Lewis and Thornhill, 2012; Creswell and Poth, 2018). Theoretical sampling is usually followed when a researcher applies grounded theory, where concepts/ themes, not people, are sampled (Corbin and Strauss, 2015). Hence, researchers go to people, places, and situations that will provide information about the concepts that they want to explore. This approach is particularly crucial when undertaking a study about a new area, as it facilitates the exploration of issues and problems from various perspectives (Corbin and Strauss, 2015).

The participants of this study were educators in colleges and universities, both government and private institutions, across Oman, teaching the compulsory course of entrepreneurship (Entrepreneurship: Creativity and Innovation). The primary criterion for participating in the study was that the entrepreneurship educator must have taught the subject for a minimum of three semesters. This requirement ensures that the educators had sufficient experience to reflect on and discuss the teaching methods employed in the course over an extended period.

I recruited participants using two sampling methods. I applied the purposive sampling approach. I leveraged my network of entrepreneurship educators, reaching out to them individually through WhatsApp and sending email invitations. The snowballing technique was also employed, with interviewed participants suggesting other educators from different educational institutes. This allowed me to expand my reach to additional participants, aiming

to interview at least one entrepreneurship educator from each targeted institute. Conducting interviews continued until theoretical saturation was reached, a point at which no new categories emerged in the data (Corbin and Strauss, 2008). In the final five interviews, very little new information surfaced, indicating that saturation had been achieved as no additional emergent categories appeared. Corbin and Strauss (2008) emphasise that researchers should persist with data collection and analysis until theoretical saturation is attained, and there is no prescribed number of interviews required. Ultimately, I conducted interviews with 30 participants.

The email included an invitation for participation in an online interview, along with two attached documents: the participant information sheet, providing detailed information about the research, and the consent form, which participants were required to sign and return before the interview. Subsequently, I coordinated with each participant to determine a suitable day and time, considering the 3-hour time difference between Oman and the United Kingdom. Online invitations through Microsoft Teams were then sent. All interviews were conducted using Microsoft Teams, a platform familiar to all participants as they had utilised it for teaching during the pandemic. In general, the interviews proceeded smoothly without encountering any issues.

Interviewing is a commonly used method for data collection in qualitative research (Bryman and Bell, 2015), where selected participants are questioned to delve into their thoughts, feelings, or actions concerning a particular topic (Collis and Hussey, 2014). Interviews can provide new understanding, discovery, reflection, and/or clarification, presenting an organic and adaptive approach that can invigorate the understanding of the phenomenon under investigation. Rubin and Rubin (2012) metaphorically liken interviews to "night-vision goggles" (p. vii), enabling researchers to explore complex phenomena that might be concealed or unseen. Beyond neutral question-and-answer exchanges, interviews are dynamic processes where individuals engage in self-discovery and mutual understanding (Fontana and Frey, 2000), with the interviewer and interviewee collaboratively constructing meaning and shaping a narrative (Tripp, 1983). Finally, Braun and Clarke define interviews as "professional conversations with the goal of getting participants to talk about their experiences and perspectives in relation to a topic" (Braun and Clarke, 2013. p. 78), aligning with the core of this current research. Since the investigation focuses on the perceptions and experiences of entrepreneurship educators regarding the use of digital artifacts in their teaching practices, interviews are well-suited to explore and probe the phenomenon of technology adoption in entrepreneurship education.

According to Briggs (1986), 90 percent of social science investigations rely on interviews (p.1). This is attributed to several valid reasons, as stated by (Lindlof and Taylor, 2017). Employing interviews can unveil participants' opinions, experiences, and motivations regarding a specific topic. Simultaneously, participants can provide justifications, explanations, or rationales for their opinions and actions. Interviews, in particular, offer insights into information and background on subject matters that may not be observable or accessible, such as discipline and habits. Furthermore, researchers have frequently associated grounded theory with interviews, despite the fact that grounded theory can be applied to a variety of data collection methods (Charmaz and Belgrave, 2019).

The two common forms of interviewing are unstructured and semi-structured, both of which are recommended for exploratory, qualitative research (Bryman and Bell, 2015). Unlike unstructured interviews, in semi-structured interviews, the researcher follows an interview guide with a predetermined list of questions for the participants. Additional questions may also be developed during the course of the interview, as the interviewer can generate new questions based on the responses. Conversely, the interviewee has the freedom to decide how to answer (Collis and Hussey, 2014). For this research, I adopted a semi-structured interview style because I intended to ask the participants the same list of questions. During the actual interviews, I also posed other questions that were not in the interview guide but arose based on points made by the participants (Bryman and Bell, 2015).

Adopting a semi-structured interview approach, where questions are mostly open-ended, has allowed the participants in this research to express themselves freely, without any restriction. This was clearly captured in the transcription phase, where some answers spanned about half a page, and others even filled a full page. In addition, the semi-structured approach has provided me with great opportunities to engage with my participants by clarifying certain points and probing for more information or examples when needed (Bryman, 2012). Moreover, misunderstanding was reduced for both parties due to the conversational explanatory power of the interview methods offered (Briggs, 1986), and participants expressed themselves clearly when they were unsure about specific points in the questions. Before concluding the interview, a number of participants stated that the questions were also supportive in making them think about "effective technology adoption," and some even mentioned that the questions had inspired them to initiate projects related to the topic of technology adoption. This could be attributed to the way the interview guide was prepared.

An interview guide is a list of questions to be asked or issues to be addressed to the interviewees during semi-structured interviews (Bryman, 2012). When designing a qualitative

interview guide, Lofland and Lofland (1995) suggest that the researcher should start from the research questions and reflect on the aspects of the phenomenon that require further exploration. In addition, Bryman and Bell (2015) propose some basic elements for preparing the interview guide, such as determining the order of the questions to ensure a smooth flow, moving from general to specific, and formulating questions in a manner that facilitates comprehensive answers without being overly specific. The researcher should also avoid asking leading questions, and the language used should be comprehensible and relevant from interviewees' perspective. As for this research, I tried to design the research guide in a manner that stimulates the entrepreneurship educators to discuss the different digital artifacts used in entrepreneurship classes, the factors that hinder using up-to-date digital artifacts, and the strategies to improve the current facilities. I moved from asking general to specific questions.

All the interviews were conducted online via video conference through Microsoft Teams. Online video meetings provided me with the opportunity to connect with educators from different institutions across Oman, and the timing was arranged according to their convenience. Microsoft Teams also offers the option to record the meetings, allowing me to concentrate on the conversation, fully engage with the interviewee, and delve deeper into specific issues instead of taking notes. Participants were mostly situated at their workplaces, while some were at home, sitting comfortably. The interview process proceeded smoothly without any issues from either side. All interviews were conducted in English.

Considering that the main research question of the current study is "*How does the process of digital artifact adoption unfold by entrepreneurship educators?*" I organised the interview guide into three main sections. The first set of questions covers some personal questions about the entrepreneurship educator. Section B, the second section, contains three parts, each related to one sub-research question, as the three sub-questions aim to answer the main research question, which is about the process of adoption of digital artifact in entrepreneurship education. After drafting around 16 questions, while keeping in mind the general rules of the interview guide, the questions document was sent to the supervisors for their feedback before being submitted, along with other documents, to attain the BREO before commencing the interviews.

When the interviews commenced, each session began with some general questions, such as inquiring about their origin, their experiences in Oman, their current place of residence, or their educational background. The purpose of these general questions was to establish a good rapport with the interviewees, considering that most of them were meeting me for the first time in an online setting. Then, I would remind them to begin recording the meeting for the purpose

of data analysis. I also inquired whether they had read the participant information sheet to ensure their awareness of the interview topic and their understanding of the term "digital artifact" (DA). The first set of interview questions is also quite general but relevant to entrepreneurship teaching practices. These questions revolve around their current workplace, age group, academic qualifications, whether they have taken any teaching courses, and the number of semesters or years they have been teaching entrepreneurship. Following this, I would pose the question, "How and why did you get into teaching entrepreneurship?" With that last question in the first section, I aimed to transition into the main questions and set the tone for the rest of the interview.

After gathering general information, I proceeded to inquire about the first sub-question: "What factors facilitate the adoption of DA in EE teaching practices?" There are three questions under this main question. I initially posed the question, "Which DA do you use in EE, and how often do you use them?" Why?" This sought to identify which digital artifacts, such as pictures, videos, and serious games, participants use in their entrepreneurship classes and, more importantly, how often they use them and the purpose of using them. After conducting two interviews, I recognised the question's length and subsequently divided it into three shorter questions for subsequent interviews. I began by asking, "Which DA do you use in EE?" followed by "How often do you use them?" And then, where answers were short, I asked them to elaborate further on their response by asking "Why." This approach encouraged participants to provide detailed reflections on each aspect separately. The second question focused on the available facilities to promote the use of DA in EE. The final question of this part is, "How important do you think that using DA in EE is?" as I wanted to inquire about the participants' opinions on the significance of using DA in EE.

Next, I would transition to another set of questions focused on the factors that hinder the adoption of DA. This set aimed to explore the various challenges entrepreneurship educators face that might impede the incorporation of different digital artifacts in entrepreneurship teaching classes. Participants provided insights into the obstacles they encounter. Additionally, there was a question addressing their perception of learning new technology, and I inquired about the ease or difficulty in finding suitable digital artifacts on the internet. This question aimed to investigate whether the accessibility of appropriate digital artifacts could be a contributing factor to the adoption challenges.

The final set of questions cantered on exploring the strategies to overcome the identified obstacles and eliciting suggestions on enhancing entrepreneurship teaching with regard to using digital artifacts. Initially, when discussing strategies, many participants provided general

suggestions and recommendations. To obtain more specific information, I refined my approach by emphasising that I sought details about the strategies they personally implemented for each impediment. Subsequently, I concluded the interviews by inviting participants to share any additional insights or thoughts before concluding the session and stopping the recording. Following the completion of the interviews, I expressed gratitude to the participants for dedicating their time to the interview process.

3.4 Other Interview considerations

Data quality: data quality is one of the main concerns in interviews. Being aware of it, I tried my best to ensure that each participant would provide accurate and sufficient information about each question being asked. Some participants required prompts or examples to encourage detailed responses, while others naturally provided extensive answers. Recording and transcribing the entire interview process were essential for capturing the maximum information related to the collected data (Saunders, Lewis and Thornhill, 2012). As stated earlier about the strategies question, I had to stop the participants and make sure that their answers are about strategies, not suggestions or recommendations on what needs to be done.

Reliability and validity: reliability in data collection pertains to the consistency of results if the same interview questions were administered by another researcher or conducted on a different occasion. There are potential threats to reliability, including participant error, participant bias, researcher error, and researcher bias (Saunders, Lewis and Thornhill, 2012). Since I am the researcher, I will focus on addressing researcher bias. To mitigate researcher bias, I employed a semi-structured interview approach, ensuring a predefined set of questions and minimising personal influence on participants' responses. The interview guide was designed to maintain a neutral tone, avoiding leading or suggestive questions. Additionally, I adhered to the same set of questions for each participant, reducing variability in data collection. Consistency in the interview process and adherence to ethical research practices contributed to enhancing the reliability of the study.

Researcher bias is a potential threat to the quality of qualitative data in interviews, arising when the interviewer's tone, wording, questions, comments, or non-verbal behaviour influence participants' responses (Saunders, Lewis, and Thornhill, 2012). While complete elimination is challenging, awareness and strategies can mitigate its impact. Two strategies employed to address researcher bias include:

First, interviewer biases can occur due to tone or nonverbal behaviour; they can also occur due to the researcher's questioning approach, in which the researcher uses closed-ended questions that prevent the interviewee from freely discussing the issue being asked, increasing the possibility of biases (Saunders, Lewis, and Thornhill, 2012). Interview questions in this research were mainly open-ended questions that started with "which," "how," "what," and "why," such as:

- "Which DA do you use in EE?" How often do you use them? Why?"
- "What do you think is the main barrier to not using DA in EE?"
- "How easy or difficult is it to find a suitable DA on the internet?"

The questions posed to the participants in the examples above allowed them to speak freely about the subject without being told what to say.

Second, long interview questions or ones that are made up of two or more questions can be a reason for interviewer bias (Saunders, Lewis and Thornhill, 2012). As for this research, I was aware of not making long questions, as most of the questions are not too long or I divided them into smaller questions; for example, I divided this question into three short questions. "How do you find learning new technology?" How much time does it take you to master it? "Have you learned a new technology to be used in entrepreneurship classes?"

Though reliability is vital to research quality, validity is of equal importance in quality research (Saunders, Lewis and Thornhill, 2012). Validity "is concerned with the extent to which your research measures actually measure what you intend them to assess" (Saunders, Lewis and Thornhill, 2012. p. 193). In relation to the validity of this research, I was successful in gaining answers that were relevant to the questions being asked. The issues and topics that were raised by the interviewees were mostly available in the literature.

Demand characteristics occur when participants in a study behave in a way they believe the researcher expects or desires (Maner, 2008; Damaskinidis, 2017). This can also mean participants respond based on perceived implicit preferences rather than explicit instructions (McCambridge, de Bruin and Witton, 2012). To mitigate demand characteristics during interviews, I emphasized my interest in understanding participants' daily practices and experiences related to the subject matter at the outset. I maintained a neutral tone when asking questions from the interview guide, avoiding emphasis on specific parts. Additionally, I refrained from expressing personal opinions or seeking particular answers, allowing interviewees to freely share their views. Contradictory responses can indicate question neutrality and minimal interviewer influence.

3.5 Data analysis

One of the unique qualities of grounded theory is that data collection and analysis are interrelated; therefore, data analysis begins as soon as the first interviews are collected, and further data analysis drives further data collection. This process guides the researcher to sample for relevant concepts, from which the theory can emerge (Corbin and Strauss, 2015). Thus, as I proceeded with the data collection stage, I modified the interview guide to address some of the aspects that could impact the process of technology adoption. These considerations were added later as participants raised them during the initial interviews. For instance, when inquiring about how easy or difficult it was to find suitable digital artifacts (DAs) from the internet, participants brought up the issue that, due to cultural differences between Oman and the West, finding videos related to their class topics can be challenging. This issue was not on my mind, and so in the consequent interviews, I would ask the participants about the cultural consideration if they did not raise it themselves. Further, during the interview with Raiden (interview 9), he highlighted that there is a need for more flexibility for educators regarding the syllabus. Consequently, I directed the subsequent participants to discuss this issue and express their opinions about the degree of flexibility they have in terms of the syllabus.

Also, after interviewing 13 participants, I stopped interviewing to conduct some initial data analysis, identifying emerging themes. Subsequently, I revised the interview guide to address these themes and ensure relevant questions were asked. For instance, after the initial 13 interviews, it became apparent that the use of serious games and other software were nearly non-existent, and entrepreneurship educators primarily relied on pictures and videos in their PowerPoint presentations. In subsequent interviews, I delved more deeply into understanding why educators might not be utilising more up-to-date digital artifacts and why they tend to adhere to commonly used technological tools. This approach facilitated the collection of additional data crucial for later stages of the research.

Table 4 below presents the participants' details.

Table 4: Participants' details

Participants	Age Group	Gender	Qualifications related to Entrepreneurship (Entp)?	Training related to Entrepreneurship (Entp)?	Years of teaching Entp
P1. Laura	46 and above	F	No, MA in Leadership	NO	2
P2. Abdul	36-40	M	PhD in Entp	Yes, CEE	10
P3. Zahi	46 and above	M	PhD in Entp	No	3
P4. Bala	46 and above	M	PhD in Entp	Yes, CEE	10
P5. Asif	46 and above	M	No, Master in Tourism	Yes, CEE	4
P6. Haya	25-30	F	Master in Inno & Entp	No	4
P7. Maya	46 and above	F	No, PhD in strategy	Yes, CEE	15
P8. Seema	46 and above	F	No, PhD in Management	NO	5
P9. Raiden	36-40	M	PhD in Entp	Yes, CEE & others	5
P10.Majan	31-35	F	ongoing PhD in Entp	CEE	3
P11.Rushdi	36-40	M	PhD in Entp	CEE	2
P12.Ruksat	46 and above	F	No, PhD in Management	No	9
P13.Hamed	31-35	M	No, Master in HR	CEE	5
P14.Hassen	36-40	M	No, Master in competitiveness & innovation	CEE	2
P15.Ali	41-45	M	PhD in Entp	Yes, venture creation	5
P16.Khalil	41-45	M	No, PhD in business studies	No	5
P17.Haitham	41-45	M	No, Master in Management	Incomplete of CCE	5

P18.Salma	31-35	F	ongoing PhD in Entp	Yes, TOT & in Finland	5
P19.Ibrahim	31-35	M	No, MA	CEE	7
P20.Mouid	46 and above	M	No, PhD in marketing	No	2
P21.Hana	36-40	F	Master	CEE	5
P22.Soraya	31-35	F	No, MBA	No	2
P23. Arshad	36-40	M	No, MBA	No	2
P24. Thelma	25-30	F	No, MBA	No	4
P25. Ahmed	41-45	M	No, MSc BA	CEE	9
P26. Mazin	41-45	M	PhD	Yes, many courses	15
P27. Mehdi	46 and above	M	No, PhD	Yes, Professional courses	9
P28. Shamis	46 and above	M	No, PhD	CEE & in Finland	3
P29. Harley	41-45	F	No, PhD in Quality	Online courses	7
P30. Nara	25-30	F	No, MBA & Diploma in (Business Management)	No	2

All participants teach the compulsory entrepreneurship course in Omani higher education institutions. Ranging in age from their early thirties to forties and beyond, the sample consisted of 18 males and 12 females. The former age group generally exhibited higher levels of enthusiasm for teaching the subject creatively and innovatively, often leveraging available technological tools. Furthermore, a good number of participants strongly believe in the necessity of technology for teaching entrepreneurship, and they are convinced that its use can motivate learners to start their own businesses. Nearly half of the participants have obtained or are currently pursuing relevant qualifications to teach the subject. Other have taken some training courses related to entrepreneurship, and only six of the 30 participants lacked any related entrepreneurship qualifications or had not taken a course or training on how to teach entrepreneurship. Six of the participants are business owners or entrepreneurs, considering it an asset because they can speak and present the course not only from a theoretical perspective but also from a practical standpoint. While a few institutions have taken the initiative to promote entrepreneurship, the majority have yet to fully embrace it. Entrepreneurship is often treated as just another course, rather than a catalyst for innovation and job creation. Some educators exhibit a strong commitment to the subject and effectively leverage technology, while others lack the necessary training and support. These disparities, coupled with limited institutional infrastructure, hinder the overall effectiveness of entrepreneurship education.

3.6 Ethical considerations

The College of Business, Arts, and Social Sciences Research Ethics Committee at Brunel University granted ethical approval for this study after receiving the required documents, which consisted of a draft of the interview questions, the consent form, and the participant information sheet (PIS).

Creswell (2014) emphasises that ethical considerations extend far beyond mere paperwork and approvals. As Chambliss and Schutt (2018) underscore, ethical concerns must permeate the entire research process, from topic selection to data collection and participant interactions. Navigating social dynamics, ensuring confidentiality and anonymity, and prioritising participant well-being are just some of the crucial areas demanding careful attention. This research has meticulously addressed these concerns. The Participant Information Sheet clearly outlines the research purpose and participant selection rationale, emphasising voluntary participation and the right to withdraw without explanation. The consent form further confirms participants'

voluntary engagement. Throughout the research, adherence to university guidelines ensured no harm to participants at any stage.

3.7 Data Analysis Process

The aim of data analysis in social research is to transform collected data into new understandings/ theories. Following my interview stage, I embarked on the crucial step of data analysis and theory generation. Grounded theory generally uses an inductive approach, allowing knowledge to spiral upward like building a pyramid. Initial "lower-level concepts" lay the foundation, progressively leading to the formation of "categories" and ultimately culminating in the "core category" (Corbin and Strauss, 2015). The systematic set of procedures followed in grounded theory as suggested by Corbin and Strauss (2015) are named open, axial, and selective coding. These sequential steps act as a blueprint for extracting meaningful interpretations from qualitative data. Furthermore, Corbin and Strauss, (2008, p.193) highlighted that "asking questions and making comparisons" are not mere byproducts of data analysis but vital cornerstones of theory development, enriching each analytic level. Consequently, data analysis in exploratory qualitative research transcends objectivity, evolving into a dynamic interplay between researcher and data, as (Gergen, 2009) aptly articulates.

In the following paragraphs, I will explain the three-step process I followed for data analysis:

1. Firstly, I began by transcribing and familiarising myself with the semi-structured interviews, providing an initial overview of the data.
2. Secondly, I implemented the grounded theory approach to coding, starting with open coding to identify key concepts, then moving to axial coding to refine their relationships, and finally using selective coding to develop a core category that encapsulated the main themes across the data.
3. In the last step, I used the coding results to build a visual model that summarises the data structure and highlights the core relationships between the identified concepts.

Analysing qualitative data requires readily available raw material. For this research, semi-structured interviews were the only data collection method, and therefore they are the source to generate codes, concepts, and overarching categories. The raw data consisted of video recorded interviews with 30 entrepreneurship educators from higher education institutions in Oman, yielding approximately 19 hours of recordings in interviews ranging from 30 to 60 minutes each. After each interview, I transcribed the video recording immediately. All the interviews were conducted and transcribed during November and December of 2022.

For the first six interviews, I used the transcription offered by the Microsoft Teams programme, downloaded as a Microsoft Word file. However, the issue was that the programme, by default, breaks the conversation into many chunks and lines and does not keep the person's speech in one paragraph, for example. This necessitated significant manual editing to consolidate each interviewee's response into a coherent paragraph. Fortunately, I discovered Otter, a website offering accurate and easily imported Word document transcripts. Otter significantly streamlined the transcription process, allowing me to focus on deeper analysis.

Transcribing interviews is a crucial step in qualitative research, and for this study, I developed a meticulous process. After a quick preview to confirm complete recordings and troubleshoot potential technical issues, I would split the computer screen. One side displayed the interview transcription Word file, and the other held the original Microsoft Teams recording. Playing the video while reviewing the transcribed text ensured meticulous accuracy. Machine-generated transcripts, while helpful, they required alterations. Occasionally, there were spelling errors. For instance, "entrepreneurship" might be spelled "intrapreneurship." Other times, certain words were substituted with others that did not make sense in the sentence, such as "where" and "were"; therefore, going through the recording would reveal which word the interviewee intended. Generally, clear voices and pronunciation meant fewer edits, but unclear audio or mispronounced words necessitated closer attention. Each interview review, typically taking two hours, guaranteed a polished, data-ready transcript.

Reviewing the recoding was also beneficial for the subsequent interview, as I utilised some of the emerging concepts and asked the subsequent interviewee about them if they had not been highlighted in the interview guide. Finally, each Word document was saved securely on the university's OneDrive, with interviewee names replaced by pseudonyms to uphold confidentiality and anonymity. Transcribing the 30 interviews resulted in a 300-page document, totalling 164,084 words – of data ready for analysis.

In the initial stage of data analysis, I started the coding process with pen and paper, manually coding transcripts to make notations. This approach, as Saldana (2016) advocates (Pg. 29), fosters an intimate familiarity with new data and grants researchers greater control, allowing them to fully immerse themselves in the content. However, the initial interview yielded a multitude of codes, rendering manual management overwhelming. Seeking a more efficient method, I turned to NVivo. Its intuitive interface and well-organised features significantly streamlined the coding process, leading me to adopt it for subsequent analyses. Even from examining the first interview, NVivo's capabilities enabled me to effectively break down the data and generate a substantial number of codes. The structured format of the interview files,

with distinct question and answer sections, facilitated the extraction of multiple codes from a single answer. While many codes aligned directly with the posed questions, others emerged unexpectedly, offering valuable insights that I anticipated would contribute to the eventual theory generation.

My qualitative data analysis relied on the robust capabilities of NVivo 12 software, accessed through the Brunel University website. As Collis and Hussey (2014) emphasise, NVivo's widespread adoption and effectiveness in managing voluminous qualitative data make it an ideal tool. Its reputation for facilitating grounded theory analysis, as highlighted by Hutchison, Johnston and Breckon (2010), further solidified my choice. Beyond its analytical prowess, NVivo excels at data organisation, deftly structuring information into categories and sub-categories with clear linkages (Richards, 2009). This user-friendly structure offered a stark contrast to the complexities of manual analysis, paving the way for a streamlined and efficient process. To embark on this journey, I prepared my data by importing 30 Word files into the NVivo software, ready for deeper exploration and insightful discovery.

Before delving into analysis, I immersed myself in the interview recordings, listening twice to gain intimate familiarity with the data. This immersion set the stage for the first stage of grounded theory analysis: open coding. As Corbin and Strauss (2015) describe, open coding involves meticulously dissecting data into smaller, meaningful chunks and assigning conceptual names to each segment. The goal is to generate a plethora of codes, acting as stepping stones towards uncovering concepts that will ultimately form the core of the emergent theory (Strauss and Corbin, 1998). These concepts, coined by Corbin and Strauss (2015) and Strauss and Corbin (1998), are essentially interpreted meanings within the data, unified by a shared characteristic or label. With the focus of open coding being to break free from preconceived notions and maximise code generation, I yielded over 95 codes ranging from single sentences to phrases and even focused segments within sentences (Miles, Huberman and Saldana, 2014). Here, I analysed without any relation to or reference to the literature, to avoid being influenced by any ideas or concepts present in the literature. This aligns with the advocacy of certain grounded theory authors, like (Hutchison, Johnston and Breckon, 2010), whose approach I embraced. My aim was to stay true to the essence of grounded theory, where the theory emerges organically from the data itself, spoken by the voices of my participants.

As I was implementing the open coding process, a number of evident concepts were nearly repeated in each interview, such as the role of the management, importance of training, the vital role of the educators, and suggestions to improve the teaching of entrepreneurship. I

have tried to make the codes as precise as possible, as this will help me generate specific concepts for each code. For example, some participants stated that training and support are available, while others said the opposite. Because of this, I put the idea (availability of support) in a code, and (lack of support) in another code.

The following paragraph shows an example of how I analysed data during the open coding process. The italicised and underlined phrases are the interviewee's speech, followed by codes in bolded brackets.

Also, *the drive like I do it because I like it*, okay, maybe others, they feel like I don't need to do it and just complicates things, I can just follow the curriculum. And that's it. *So the actual vision of the lecture themselves, as also plays, plays an important role I feel*, [**Educator willingness to learn & improve**] also *does the organisation or your institute itself recognise the effort that you are putting in, if they do, then I'm more likely to actually be become more creative, or use all of these digital platforms*, [**Importance of recognising educator efforts**] because I also have to learn how to use it. So, *I also have to invest a lot of time on how to use these platforms*, I also have to invest a lot of time to see how I can incorporate them within my own lectures. [**Learning new technology**] (Interview 10- Majan)

Having initiated concepts through open coding, the second stage of data analysis, axial coding, aimed to cultivate higher-order categories. Axial coding involves "relating categories to subcategories along the lines of their properties and dimensions" (Strauss and Corbin, 1998, p. 123). It serves as a pivot point for connecting concepts within a category, aptly termed "axial" as coding revolves around a central category, linking its constituents through shared characteristics or interactions. At this stage, the first order concepts that emerged from open coding ascend to form second order concepts, grouped based on observed similarities, connections, or interdependencies. This involves a shift towards a more abstract level of categorisation, enabling the researcher to discern broader themes and patterns embedded within the data.

After generating initial codes through open coding, I embarked on the next stage: axial coding within the NVivo software package. This phase aimed to move beyond individual codes and identify higher-order categories by grouping seemingly related items together. For instance, I readily combined codes highlighting the impeding factors of digital artifact adoption, fulfilling the essential objective of axial coding – establishing linkages between distinct concept categories (Strauss and Corbin, 1998). As Miles, Huberman and Saldaña (2014) aptly note, grouping initial codes leads to more overarching categories, ultimately enabling the

development of robust theoretical constructs. The crux of axial coding for me was to carefully merge and establish meaningful connections between diverse concepts, aiming to build a cohesive category from its constituent subcategories. This iterative process demanded considerable time and deliberation, as some codes presented challenges in terms of grouping. However, NVivo's diverse functionalities, including grouping, removing, and merging codes within a single file to facilitate a coherent structure, significantly streamlined the process.

Here is an example of how I created the second order concepts of 'Current generation & digital learning'. It refers to the current available digital artifacts that educators are using and the learners of this generation who are eager and motivated to learn through the use of technology. This category was created by integrating two themes which are the available DAs that entrepreneurship educators use and the current generation who are interested in learning through technology.

Also, when the participants were discussing the different factors that hinder the adoption of digital artifact, I initially coded them separately. Yet, after completing the process of coding and analysing the impeding factors, I was able to group them into different categories related to learners, educators, management, and infrastructure. For example, the second order concept of 'Educators' Inefficiency' compiled the different challenges that an educator could possess or be the cause of. This category was formulated by compiling themes related to: educator's teaching style & awareness using DAs, educators' competency in teaching the subject and educator's workload. This theme discusses the idea of the educator as a hindrance to DA adoption in EE. Another example of formulating the second order theme of 'Preparing the learners' which discuss what the current strategies applied to overcome the impeding factors. This category was created by integrating themes related to: more practical & fun activities, encourage learners to bring innovative ideas and discuss the issue & find solutions. Table 5 below presents the process of generating first order and second order concepts. First order concepts, highlighted in bold, were derived directly from participant narratives. Second order concepts, representing more conceptual definitions, were developed by the researcher.

Table 5: Quotes from Participants' Narratives and related 2nd Order Concepts

Quotes from Participants' Narratives	2nd Order Concepts
"We are using one program called Poll Everywhere, and we are trying to conduct some of the questions while we are explaining any case or any scenario, and then we are giving the question. Another thing is that we are trying to show some of the videos, especially the one about entrepreneurship, where we talk about the market and competitors. So, we are trying to get them to make the analysis of any of the businesses that they are comparing with them, like when we give them the video, they will explain the SWOT analysis, for example, so that they will be able to do the analysis in an easy way if we are showing the video from YouTube or from any other sources." (P22- Soraya)	Current generation & digital learning
We use different tools such as pictures and videos. And yes, we are using the Coursera platform as one of the assessments for the learners. In which the university is affiliated with that platform and learners have free access to that platform to learn about entrepreneurship. We have three courses, and the learners have access to these courses through the Coursera platforms. (P26- Mazin)	
"Otherwise, we cannot deal with this new generation because now they want games, and they want to use tablets. They want to use this type of digitalization; otherwise, the educator will not be able to communicate with these types of learners." (P2- Abdul)	
"They (learners) should see you very, very inspirational, knowledgeable on the subject, because otherwise, they will lose interest." (P7- Maya)	Educators as a vital factor

"In the teaching process, it's **your responsibility as an educator to develop yourself** and whether courses provided by your institutions or even from outside; there are many conferences, many workshops conducted by different institutions. **I joined an online course that was conducted by Prof. (...) about the feasibility study.** So, as an entrepreneurship educator, you should develop, and update yourself. Many courses are offered online these days." (P14 -Hassen)

"There is something called an intention. **The intention of the educator in terms of delivering**, for example, sometimes happens like this because the institute wants you to deliver this course, so maybe the faculty member is forced to take this course and deliver it. In this case, there will be no creativity or full intention for the faculty member to deliver it as a full fledge. So there will be some shortage and gap in execution in terms of delivering the right skills or knowledge and building the capability of the learner, while on the other side, **if the intention is there**, and there is a scope for the faculty member and the institute to collaboratively make this happen, then it will be another story." (P27- Mehdi)

"Thankfully, **they share my vision.** So, the atmosphere or the environment of the university itself, you can see also, **the vision of the heads of the university also plays**, I think, a very important role. If they share your vision, then it's very easy for you to do with, basically, how you wish to do it." (P10- Majan)

External success factors

"We do have **all the possible facilities and constructions and infrastructure use required for this job**, whatever you need is there. We do have the computer labs, we do have the online, we have the access we do have. So any sort of accessibility required for those items? I think we do have provide them for learners and for the educators as well." (P16- Khalil)

"**The management is very supportive** if I want any kind of reference, books or technology, or if I want to take my learners out on a field trip, if I want to invite anybody to the college, or introducing any kind of

thing that helps learners to learn better, **management supports at any level.**" (P29- Harley)

"The first barrier is the learners. In my case, learners are not familiar with these methods of teaching; **their perception of teaching is the traditional classroom setting.** We, as educators, are either the source of information or they're reading from the books." (P3- Zahi)

Recipient as a hindrance of technology adoption

"Sometimes we have **some learners who just want to complete this; they're not much interested.**" (P12- Ruksat)

"Number one as a hindrance is the personal characteristic of the learners, because those learners are not receptive; **they are not, and they don't have the willingness to accept the usage of those materials.**" (P16- Khalil)

"I think the second thing depends on the faculty himself. Some of the faculty **are not aware, they are not well trained,** and some of the faculty, we can call them classical. They follow the classical system, **they do not believe on the impact of these digital tools in teaching.**" (P2- Abdul)

Educators Inefficiency

"I hope that one day we'll have those people who are really specialised in entrepreneurship, so that they can really make a difference. They can add value; they can share their experience, **compared to those who are not specialised.** Some of them are not really interested in teaching entrepreneurship course, but while we have big number of learners, they are requested to teach. **Some are not really qualified enough to teach entrepreneurship** course, but because there is a shortage of stuff, they have been asked to teach the course." (P13- Hamed)

"This is one of the main challenge we have here because you know **the workload or the teaching load is too high,** really. Yeah, it's a lot. this is one of the main challenges now in the process of to do some reduction in their workload, but not big difference." (P28-Shamis)

“...from my experience, number one is that **lack of culture in the institutions**. Still, institutions and learners, at least in Oman, they are in a belief of traditional way of teaching, you know, speaking and listening and doing some work on content and go for exams and pass and taking care of grades only. This is one of the reasons.” (P3- Zahi)

**Absence of
Management
support &
Resources**

“I've seen individuals discussing entrepreneurship, **but I haven't seen the head of department encouraging us** or giving us, like courses or nominating us for external workshops, so we can learn and see what others are doing, and we can adopt their ideas and their means. **I haven't seen very serious work**, but I have seen the efforts of individuals.” (P21- Hana)

“Well, to be honest, of course, this is I think, is key thing what I just mentioned **is that the lack of resources**. If you don't have these **resources or access to these resources**, that is a key limitation that will hinder technology adoption.” (P12- Rushdi)

“**I would love to do more practical teaching**, even have the class somewhere outside the college, but the problem is that we have a class test to adhere to and we have a final exam to adhere to 100 marks which is holding 50 percentage.” (P1- Laura)

**Preparing the
learners**

“Learners care mostly about marks. But from my side, I **encourage them to come up with innovative business ideas** and feel that they really own the business and are ready to initiate it in the market. I **give so much support**, and I also **challenge the learners** to evaluate their feasibility studies.” (P21- Hana)

“Well, **we didn't do much to solve the problem**, but of course, we try to refer learners to other types of technologies that they can use. In the classes, we are making them do presentations, and we are making them do video-like personifications things.” (P30- Nara)

"**I was busy** because till last semester we were teaching 20 to 22 hours a week. It is only from this semester onwards that we are only restricted to 16 hours, 16 to 18 hours. Yes, workload is always there. **There's so much of admin work** also to be done. **I've been working in academic advising in the ERP system**, because everything has to go through the ERP system, **so there is a lot of admin work in that matter.**" (P1- Laura)

Optimising the educators

"**I haven't found the right tool that I am comfortable with**, and I think that suits the course, so **I'm hoping after there are more inductions and more training on these types of tools**, I will consider making the change I want." (P -Thelma)

"**I try not to depend on the internet all the time**; we have to download, for example, these programs or templates to be saved on my desktop, and we can access them anytime without using the internet." (P18- Salma)

"We have good communication with all the institutions in Oman, and there is a gap in utilising this. **There is no action plan for creating local case studies and no initiatives taken by any organisation, even the ministry itself**; there must be a plan from the ministry, **yet nothing in reality.**" (P2- Abdul)

Role of the Regulator

"For almost two years, we started to receive funding and resources for software and so on, but **later funding was discontinued. They were not willing to pay** because they said, maybe you can find free alternatives. This kind of challenge is to find the open sources, for example, YouTube, Google Search, and other material, to find some kind of material, or sometimes to create material myself by collecting different things and use the local business environment as a source sometimes." (P25- Ahmed)

Selective coding marks the final phase of qualitative data analysis, where the focus shifts from individual codes and categories to constructing a cohesive emergent theory. Strauss and Corbin (1998) aptly describe this stage as integrating various categories around a central concept to lay the foundation for the theoretical framework. The process entails refining and merging the key themes identified through axial coding (Strauss and Corbin, 1998). By scrutinising these integrated categories, the researcher seeks to unearth the overarching abstract concept they embody, ultimately leading to the formation of a core category (Corbin and Strauss, 1990). Gioia, Corley and Hamilton (2013) and Harrison and Corley (2011) refer to these core categories as aggregate dimensions. Their defining characteristics are frequent occurrence within the data and the ability to logically link other categories to them (Strauss and Corbin, 1998). Once this stage is reached, no further relationships or properties can be incorporated into the analysis, signifying the completion of the theory-building process (Strauss and Corbin, 1998). As the aim of this present research is to investigate the process of digital artifact adoption with entrepreneurship educators, I successfully identified core categories within the second order themes. These themes served to elucidate the principal concept underlying each first order category. Ultimately, this culminated in the formulation of aggregate dimensions constituting the emergent theory. For instance, the second order themes highlighted various strategies, such as 'Preparing the learners', 'Optimising the educators' and 'Role of the Regulators.' These converge on the core category 'Tackling the Obstacles,' signifying that these strategies act as pathways to overcome hindrances.

While the literature outlines the objectives of selective coding, its practical implementation proves far more nuanced (Strauss and Corbin, 1998). My own experience mirrored this complexity. While axial coding presented initial hurdles, selective coding emerged as the true crux of the challenge. Identifying and conceptualising core categories proved a demanding task, necessitating repeated iterations in aggregating second order concepts to arrive at logically sound, yet abstract, central themes. Embracing various visualisation techniques, including data displays and hand drawings, proved invaluable in facilitating inter-theme linkages and the subsequent merging of first order concepts into second order, and ultimately, core conceptual themes. This visual distancing, as Strauss and Corbin (1998) suggest, enabled me to step back and focus on extracting salient concepts from the data landscape.

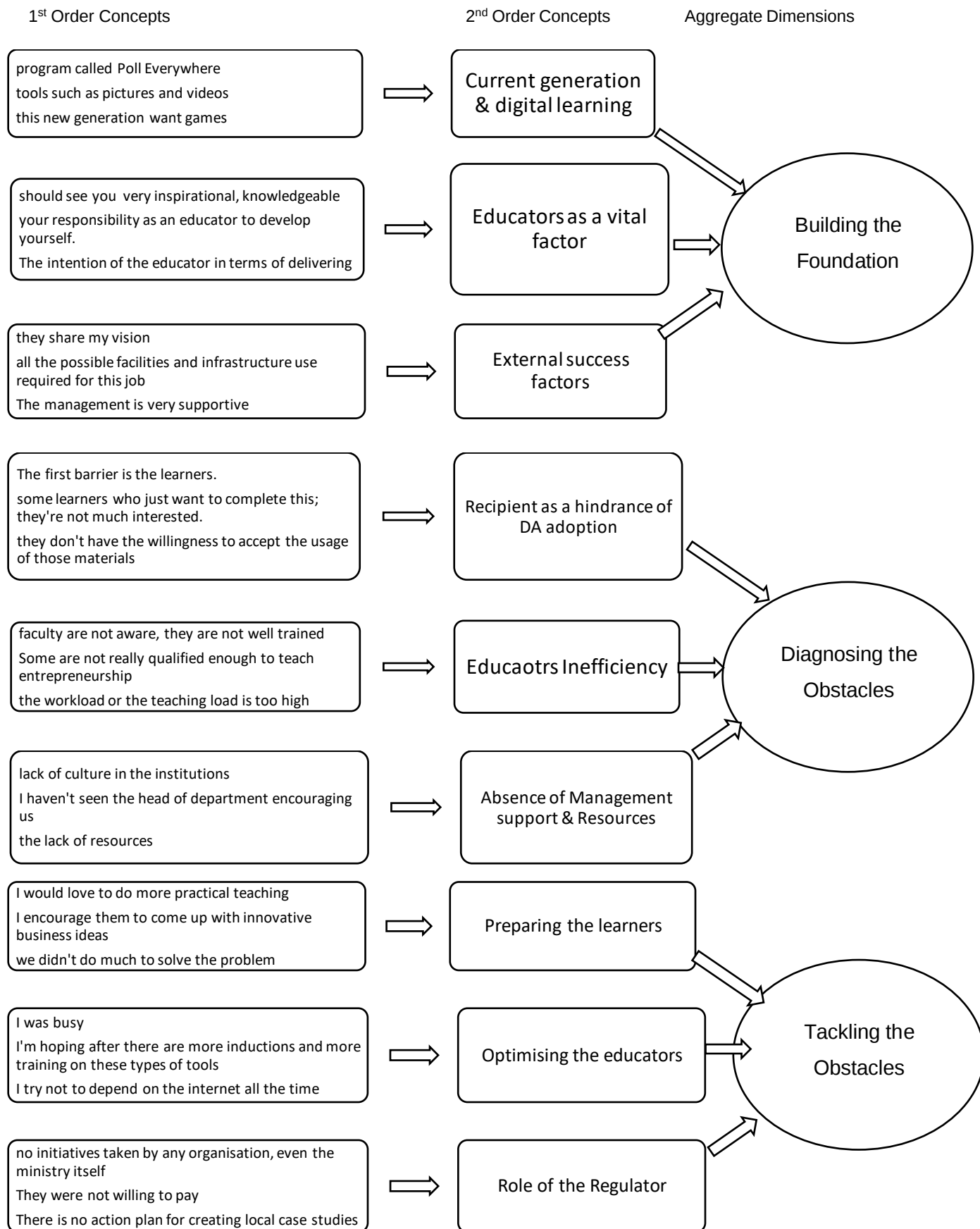
The data analysis journey proved to be an iterative, at times overwhelming, but ultimately rewarding process. It demanded a constant shift from practical to more theoretical and conceptual grounds. This iterative refinement continued until I achieved a clear grasp of the interconnectedness between various concepts and the emergent theory itself. After

successfully navigating the three forms of coding – open, axial, and selective – and constructing a visual representation of how technology adoption unfolds over time, the next step was to write and present the findings.

Data Structure:

(Below is Data Structure, to generate the Aggregate Dimensions)

Figure 6: Data Structure



This chapter of Methodology delved into the methodological framework employed to address the research questions. It commenced by establishing the underlying philosophical lens through which researchers view the world, subsequently guiding the selection of the most appropriate method to answer those questions. In this research, interpretivist research philosophy and an inductive approach are used to view the sample being studied. Plus, a qualitative research approach was adopted to understand how the process of technology adoption unfolds over time. Data was collected using semi-structured interviews with 30 entrepreneurship educators from different higher education institutions in Oman. All interviews were conducted online, using the Microsoft Teams program.

Later, I wrote about the way I organised the interview guide and the process of asking the questions to the participants. I also highlight some crucial interviewing considerations, such as reliability, validity, and data quality. I also briefly mentioned the ethical matters that were considered in this research. Finally, the chapter ended with the data analysis process. Using grounded theory, I discussed how the process of data analysis and theory generation took place, that led to produce the first order themes, the second order themes, and the aggregate dimensions. The following chapter will discuss the findings.

Chapter 4: Findings

4.1 Introduction

This chapter presents the emergent findings from the analysis of the collected data. Specifically, I outline the aggregate dimensions of the process of DA adoption in EE, as evidenced from the analysed interview data. The research findings present three stages that outline the process of DA adoption in EE. The first stage, 'Building the Foundation,' identifies factors facilitating DA adoption. The second stage, 'Diagnosing the Obstacles,' outlines impeding factors. Finally, 'Tackling the Obstacles' presents strategies to overcome these challenges.

'Building the Foundation' is the first stage which incorporates three second order concepts themes, demonstrating the factors that facilitate the adoption of digital artifacts: the current generation and digital learning, the educators' role, and the external success factors. I discuss these findings in detail in the below paragraphs.

4.2 Building the Foundation

4.2.1 Current generation and digital learning

Given the importance of comprehending the different factors that facilitate the adoption of digital artifacts, it is crucial to understand the current situation; specifically, what digital artifacts are entrepreneurship educators currently using. One of the questions posed to participants focused on the current digital artifacts used in entrepreneurship classes. From the data, it can be stated that some educators use multiple digital artifacts and are eager to try new tools, while others are limited to one or two types. Additionally, a good number of participants mentioned that they use pictures and videos in every class, while very few participants mentioned that they do not use pictures or videos often, relying more on lecturing and group discussions.

Generally, nearly all participants answered that they use pictures and videos embedded in the PowerPoint slides of their lessons. Some educators, as Abdul, Zahi, and Hanaa explained that the first part of the semester, one to two months, is spent teaching the theoretical part of entrepreneurship, and so they depend a lot on digital tools such as pictures and videos to explain the theoretical part.

Laura, Seema, Arshad, Zahi, Harley and Ali said that they use videos about entrepreneurs and successful entrepreneurs. Ruksat added that videos are supportive for teaching idea generation: *"So during that time, what we do is, we expose them to different entrepreneurs and different kinds of businesses around the world that is happening within Oman and outside Oman."* Hamed also emphasised that using pictures and videos make classes more interactive and help in information retention. Similarly, Majan stated that she uses pictures more often than videos, saying:

What I did instead was have live sessions with an actual entrepreneur. So, I did not show them a video of an entrepreneur speaking, but I got the actual entrepreneur to talk to them, so that they have a direct one to one session with them, they can ask their questions, get instant feedback, and so on. And of course, being it online, it made it very easy. Some of the entrepreneurs we have never thought that we will be able to have a chance to interview them. I was able to get good candidates because it was online.
(P10- Majan)

So, Majan prefers that learners communicate directly with an entrepreneur instead of showing videos, so learners can utilise his/her presence effectively. Seema follows the same strategy; she confirms, *"We use videos, we do conduct online seminars with people outside; they talk about their experiences, or they do give some input to the learners; you know, everyday teacher, same teacher is talking to them and sometimes some other entrepreneur or other person is talking about it makes a difference. We do conduct online workshops."* Seema appears to perceive online workshops as a valuable opportunity to engage with actual entrepreneurs which also provides a refreshing change from continuous interaction with the same educator.

During the interviews the participants presented various examples of utilising pictures and videos in entrepreneurship classes. For instance, Hassen explained as to how did he use pictures to clarify the distinction between creativity and innovation: *"So I kept two pictures to make it very clear to them how we can differentiate creativity from innovation. For example, I kept one, which is the old mobile phone or the first one, and I came to iPhone, and then I told them, if you create something for the first time, then we can see that this is kind of an invention. But if you can develop it, if you can renew it, if you can add features to make it better, then we can say this is creativity."* Hana shared a similar experience, stating that when she was teaching about the importance of packing and using environmentally friendly products, the learners grasped the concept better after seeing some pictures. *"I discussed it first, and it was hard to understand. Then later I showed them what do I mean, I tried to bring examples of businesses in Oman, running in Oman, that they apply such kind of environmentally friendly products."* Bala also explained that videos can help learners comprehend complicated

concepts or theories. He provided an example of how a short video featuring Sara Sarasvathy (Entrepreneurship scholar) effectively explained the myths of entrepreneurship. These examples show that educators primarily use pictures and videos to elucidate concepts and bridge theory with practice.

Several participants mentioned that they use case studies in digital form. Abdul, for example, used YouTube videos to ask learners to listen, discuss and analyse the case study. Zahi and Haya echoed Abdul in the following excerpts:

With the case studies, we provide them (the learners) an opportunity to learn from the success stories of others, to evaluate the strategies, and to have a criticised upon some successful stories, so we try to find the learners an opportunity to analyse and think about the opportunities, how to prioritise them, and link them with some strategies, and so on. (P3- Zahi)

I like to use some case studies that are uploaded on YouTube and in videos. So, I play videos of case studies for some companies, especially in marketing cases we can find a lot on YouTube. I play the video, and then I would discuss it with my learners. I had realized that the learners are more attractive on watching a video rather than distributing a paper. (P6- Haya)

The participants also employ various digital artifacts in their entrepreneurship teaching. Platforms like Moodle and Blackboard are used for discussions and material uploads, as indicated by Bala, Haya, Harley, Majan, and Ibrahim. The latter mentioned, *"So every week we teach them (learners) a topic, then we ask them questions on the discussion board, and then we request them to share their ideas to agree or disagree with each other"* (P19-Ibrahim). Additionally, Soraya uses the Poll Everywhere website to engage learners with different question types, such as multiple choice, open-ended, and yes/ no questions. Laura elaborated on the use of applications (apps) in her entrepreneurship class, noting that some learners not only use apps but also create them. Raiden incorporates free materials from LinkedIn written by entrepreneurs, modifying them before distributing them to his learners. Kahoot is also employed by Majan, Ruksat, and Hamed. Hamed, for instance, explained that Kahoot makes the class interactive, allowing space for targeted activities. Ruksat highlighted that Kahoot is suitable for short quizzes and revision exercises. Nara uses Canvas, uploading course materials, assignments, and communicating with learners, making it the primary platform for submitting assignments.

Hassen captured my interest by mentioning numerous digital artifacts used in his entrepreneurship class. He cited the business model canvas, the value proposition canvas, online mind mapping, learning trees, and the Ishikawa fishbone, among others. He explained: *"I use Learning Tree just to see what my learners expect actually to learn from this*

course, and for example, at the end of the week or at the end of each chapter, I will ask them to give me their feedback on what they already learned." (P14- Hassen)

As will be discussed in more detail later, Hassen's participation in various trainings and workshops has positively influenced his ability to utilise multiple digital artifacts. He expressed eagerness to learn about different digital artifacts and then apply them in his teaching. Abdul also highlighted that the university's textbook provides links to certain websites, enabling learners to access extra information, tutorials, and additional case studies. Finally, Ibrahim pointed out that the level of technology integration in entrepreneurship is still insufficient, and more efforts should be made. He commented that if educators teach learners about creativity and innovation, they should use innovative and creative tools in entrepreneurship classes.

Mazin pointed out that 'they' use the Coursera platform as a learning tool for learners, where they need to access and learn 3 identified modules, and that is part of the assessments. Mazin elaborated:

And yes, we are using the Coursera platform as one of the assessments for the learners. In which the university is affiliated with that platform and learners have free access to that platform to learn about entrepreneurship. We have three courses, and the learners have access to these courses through the Coursera platforms. There is a lot of entertaining learning, some videos, and explanations of some concepts. By the end of the course, they can get a certificate for that course. And this is also part of the assessment for the entrepreneurship course. (P26- Mazin)

Besides the availability of various digital artifacts that encourages educators to use them, nearly all participants expressed the idea that it is easy to find multiple digital artifacts from the internet, free of charge. Ali said, *"Nowadays, just by simple search in Google, you can find pictures or videos easily."* Hassen also noted that for some DAs, you need to register an account, but that is still simple.

Furthermore, teaching the current generation requires using multiple teaching strategies, and using DAs is one of them. This is an idea that many participants have demonstrated. Using different digital artifacts is important for conveying ideas in a clearer manner and creating an engaging class environment. The current generation cannot be taught through lecturing only. Abdul, for instance, confirmed, *"Otherwise, we cannot deal with this new generation because now they want games, and they want to use tablets. They want to use this type of digitalization; otherwise, the educator will not be able to communicate with these types of learners."* Arshad also confirmed this point and pointed out that it is essential to diversify the teaching methods to have a lively class. Ahmed also asserted that traditional teaching methods are not attractive to this generation because their attention span is short for normal lecturing. They need

teaching methods that can engage them, and new technological tools are something that does so successfully. This implies that educators need to alter their old teaching strategies to more recent ones, employing newer technological tools, so that they can cope with the requirements of the learners and benefit them.

Majan found on different occasions of her teaching that learners have good knowledge about technology, and they were able to assist and guide her to certain websites or applications, which she found interesting and then shared them with other learners: *"I found sometimes that actually they are more knowledgeable in technology than us. Sometimes they teach me how to use some platforms or some software that they were able to find that help them in business development, and they would show me: oh we found the software, it's very helpful and you can tell other learners about it. And I would share that as well during the lectures that these are some tools, or these are some software that you can use to develop your business idea."* Bala shared the same idea that the learners of the current generation are more proficient in technology than the educators themselves. Consequently, it is imperative for educators to enhance their digital competency to match the level of their learners and meet their expectations.

In addition, a number of participants highlighted that, after the COVID-19 pandemic, learners' realisation of the importance of technology in learning has definitely increased. This, for example, was reflected in the business ideas that they came up with, as Haya affirmed, *"during the pandemic, the learners are realising the importance of shifting their businesses to a digital one."* Maya shared a similar narrative:

Technology keeps on moving. So we have to bring in technology, meaning while we are developing entrepreneurs and business owners, we have to make them know and understand what are those supporting technology that will improve and facilitate the conduct of the business? Yeah, meaning that's one of support, what are those things that they can use? So, it has to be there in the class, and they shall see it. You know, right now, with this COVID-19, one of the things that we shared in class is, we see a lot of advantages moving on right now for entrepreneurs, from where they were before, that they can do business only, you know, having businesses on the streets, in the mall, now, they can do huge businesses online. And that's one of the advantages of COVID technology and the technology through COVID. Correct? We say that it's a technology brought by COVID.
(P7 – Maya)

Therefore, it can be stated that one of the advantages of incorporating multiple types of technologies in class is their impact on learners' business ideas. Majan, in practical terms, asked her learners to devise a business idea that would thrive during COVID, and the result was: *"...and we got really some good ideas. And what was really amazing is that some of*

these ideas after a few months, we actually found them in the market. So, as we found them in the market, it was good to see that actually they came up with very feasible ideas." Based on Majan's experience, the utilisation of available digital artifacts in class can be manifested in learners' business ideas, potentially transforming them into real-world businesses.

The above section discussed the available DAs used in entrepreneurship classes, and the importance of using multiple DAs for the learners of the current generation. The table below presents a list of respondents who addressed the above-discussed theme of *current generation and digital learning*.

Table 6: Current generation & digital learning sample excerpts

Current generation & digital learning
"We use videos, you know, for example, for inspiring talks by entrepreneurs or by public speakers. We also use technology, you know, as well. You know, for example, that we use things like the LMS and the blackboard for discussions like Blackboard discussion." (P19- Ibrahim) "We are using one program called Poll Everywhere, and we are trying to conduct some of the questions while we are explaining any case or any scenario, and then we are giving the question. Another thing is that we are trying to show some of the videos, especially in the one about entrepreneurship, where we talk about the market and competitors. So, we are trying to get them to make the analysis of any of the businesses that they are comparing with them, like when we give them the video, they will explain the SWOT analysis, for example, so that they will be able to do the analysis in an easy way if we are showing the video from YouTube or from any other sources." (P22- Soraya) "We use videos, we conduct online seminars from people outside; they talk about their experiences, or they do give some input to the learners; you know, the same teacher is talking to them every day, and sometimes some other entrepreneur or other person is talking about it. That makes a difference. We do conduct online workshops." (P8-Seema) "I use a lot of videos and a lot of case studies. OK, then I also use a lot of journals like printed artifacts, and I do make my own PowerPoint projection slides, which are a combination of like secondary sources like books and journal articles and YouTube videos on young entrepreneurs or successful entrepreneurs and different kinds of entrepreneurs. So I use this kind of. Plus, we also use apps. You know, apps are now one of the most

important things about digitalization, so you will be surprised to learn that there are often learners in the module who are studying entrepreneurship. They themselves are part of certain apps." (P1- Laura)

"In Canvas we are uploading all the notes over there, and we publish assignments over there. Learners need to submit everything through the canvas and later on we will go through the plagiarism, Turnitin, everything will be there, and according to the level we are giving marks for them. also, any announcement and communications completely go with this system." (P30- Nara)

I use something called the Ishikawa fishbone. Because normally, in order to let the learners, start looking, for example, for an idea, I give them a problem and then I want them to find the roots of that problem. So, at the end, I want them to, for example, to give me ideas to solve those problems. So, I made a competition with my learners, and I give them the problem and I shared with them the Ishikawa for example diagram. So, I let them give me the roots of the problem. (P14- Hassen)

"So the kind of competence that the learners have on technology is far superior than the trainers themselves, yeah, than the educators themselves. And without any kind of digital intervention, it is very difficult for a non-trained or non-familiar faculty member to even run it at 10% effectiveness. The traditional teachers, faculty, when they come up with, Oh, I don't know how this works, and you know that fear of technology makes the learners, who are much younger and they are from a different generation, very impatient, so it is very, very important for educators to progress in technology." (P4- Bala)

"This new generation needs this digitalization; they need these types of software. They need this type of technology. And there's a life change, and we cannot use the same previous methods of teaching. OK, now that the new generation has more understanding, if we link them to this to use such kinds of these, what you call DAs, OK. And then the student also, they will not feel bored at all; they will be more excited; they will be more interested." (P2- Abdul)

"It is very important to use the technology. Why? Because in the end, the last trends of our lives will be totally different. It is not only for us; it is for the learners because this generation will be a little bit different than they were before. If we are going to compare those people, they need to focus more on the technology because the technology is like growing up from day to day." (P22- Soraya)

"Nowadays it is necessary and essential to diversify the methods of teaching such subjects because these are up to date. And nowadays, in order to feel alive on these subjects, you need to bring out some of the for example, even read stories about some of these entrepreneurs that they have been going through a lot of obstacles challenges, then at the end of the journey, they have been succeed and not just locally even internationally." (P23- Arshad)

"For this younger generation, normal, traditional teaching is not attractive. It's not motivating to them, and it also affects their ability to focus. It's less than before that they can't give you their attention for a long time. I noticed this very clearly that most of the learners at the undergraduate level, most of them, can't focus when you talk directly like a normal lecture without any material to focus on for more than 10 to 15 minutes. So, they need some kind of learning facility that can maybe attract their attention more." (25- Ahmed)

"So we must push and support them (learners), and facilitate their use of these tools because once I believe they are engaged in such activities, they will become self-motivated and self-directed, and sometimes, but not always, many of the learners will go above our expectations if they are given this opportunity." (P3- Zahi)

4.2.2 Educators as a vital factor

According to the data, a number of participants emphasised on the pivotal role of educators in the DA adoption process. The behaviour, the characteristics and engagement of the educators emerge as critical factors in technology adoption, even when resources are limited. These educators actively incorporated multiple DAs and minimised the traditional teaching style. Many sought training opportunities, either from their institutions or via online platforms, enhancing their ability to use various tools in entrepreneurship education. As a result, a significant influence on technology adoption became evident. This central role of educators emerged as a prominent theme in the data analysis, referred to as "the educator 's role." Within this overarching theme, several sub-themes surfaced, including the educator's awareness of the importance of technology, the educator's willingness, passion, and motivation, educators' initiatives for effective entrepreneurship teaching, and educators working as a team. The subsequent paragraphs will delve into each sub-theme in detail.

To effectively utilise DAs in teaching, educators must possess a comprehensive awareness of their significance in teaching entrepreneurship. Awareness of the importance of technology is fundamental, as it can be implemented only after this awareness. Overall, the consensus among respondents is that educators now recognise the importance of integrating technology

into their entrepreneurship classes. They acknowledge its role in elucidating abstract concepts and rendering the subject more practical. Thelma emphasised the significance of using technology to inspire and facilitate learning from successful entrepreneurs for the current generation. Mazin echoed this sentiment, stating that employing various digital tools serves to inspire learners and clarify concepts. Nara added that technology contributes to creating a dynamic and engaging classroom environment. Mehdi presented an example of how technological tools can help entrepreneurs nowadays. He provided the following example:

For example, a couple years back, if an entrepreneur wants to understand, for example, in terms of generating an idea, so the learners, what they will do, they will use the normal canvas business model or they will use any simple method to evaluate the business, to evaluate whether those ideas can be converted to a business idea or not, but nowadays, no. We have digitalised programs, we have artificial intelligence (AI), which helps the entrepreneur immediately understand whether this can be converted to a business idea or not. Also, it will show whether there are different other factors need to be taken into consideration before implementing this idea into practice or not. So immediately we can understand, and we can estimate the gap which is available in transferring the idea from the paper into the practical aspect. (P27- Mehdi)

Laura also expressed that even learners are aware of the importance of technology in teaching: *"I'm aware that it is important, and along with me, my learners are also very much aware."* Furthermore, educators are aware that using technology in entrepreneurship classes is *"interesting for the learners and interesting for the staff,"* as Ruksat affirms. Likewise, Abdul emphasised that the use of technology is important in educating the current generation. *"We cannot use the same previous methods of teaching. Now the new generation have more understanding if we link them to this, to use such kinds of these DA. And then the student also they will not feel bored, they will be more excited, they will be more interested."*

Awareness among educators has led them to participate in various types of training to effectively use technology. Hassen and Ibrahim, for example, both understood the importance of recognising technology and its use in teaching, and thus they had numerous training sessions to learn new methodologies for the classroom. Hassen also affirmed the continuous need for educators to develop themselves by enrolling in various courses, especially in the current era where many courses and workshops are offered online. *"I joined an online course that was conducted by Prof. (...) about the feasibility study. So, as an entrepreneurship educator, you should develop, and update yourself. Many courses are offered online these days."*

It was interesting to note that a number of the respondents emphasised the educator's willingness, passion, and motivation as a vital factor in utilising different means of digital

artifacts. They stated that when educators are passionate and motivated, they will learn and use different means to attract learners and make them interested in entrepreneurship. For example, Maya stated that *"They (learners) should see you very, very inspirational, knowledgeable on the subject, because otherwise, they will lose interest."* Majan also affirmed that motivation on part of the educator makes teaching much more exciting. In fact, Majan revealed that she decided to learn how to develop websites so that she could teach her students how to do so. Laura agreed that educators' willingness to learn and acquire new knowledge is important, saying, *"You know that willingness to learn and apply new tools, because if you don't do that, you're not only harming yourself, but you're also harming your learners."* (P1– Laura)

Abdul also emphasised the importance of educators' passion for learning new technological teaching methods. Mehdi also pointed out the willingness of the educator and linked it to creativity, stating that if the educator is forced to teach the course, then there will be no creativity in delivering it. An interesting point that Maya brought up was that educators with practical business experience can deliver the module better than those without business experience. Yet she explained that an educator without practical business experience *"can deliver where there is passion,"* she continued: *"And the passion—what we are saying about the passion is your passion that brings the best out of your learners."* (P7 -Maya)

Several initiatives were mentioned during the interviews, demonstrating the educator's positive role in teaching entrepreneurship. This signifies that entrepreneurship educators have not embraced the awareness of using technology but have also implemented diverse initiatives to maximise benefits for learners. The purpose of these initiatives was mainly to present entrepreneurship in a more practical manner. Here are two examples:

I wanted my learners to live the experience of a real business, so I took them to one of my friends' real enterprises. I requested that all of the learners be in the cafe. I took them to (.....) coffee shop. And the owner was there. He gave them a tour and briefed them about his business. So instead of being in the class, we had it in the coffee shop. Learners were able to meet the owner and learn his story. They asked him questions; all the thoughts and ideas, getting feedback from him, could be more powerful than giving them a full semester of theoretical entrepreneurship. That site visit gave them inspiration and insights about starting a business. (P23- Arshad)

I enjoy bringing in guest speakers to speak about their ideas and their businesses. I call them guest entrepreneurs... I do this every semester. Last semester, we managed to bring 12 guest speakers, guest entrepreneurs; this semester, I'm planning for six. (P 21 -Hana)

The participants also emphasised the significance of teamwork in enhancing the course outcomes. Specifically, they discussed the idea of collaborating with other entrepreneurship educators within the same institute. Ali mentioned that he and fellow entrepreneurship educators convene monthly to explore ways to enhance the course. Working as a team has allowed educators to implement ideas from their colleagues effectively. Mazin explained that he and other educators conduct knowledge-sharing sessions, exchanging insights on how to improve teaching quality. Hassan noted that he and fellow entrepreneurship educators exchange ideas and recommend various software for classroom use. Furthermore, Samia shared materials, such as case studies, with colleagues to ensure consistency in teaching topics across different batches: *"We do share case studies, because most of us would like to discuss the same thing with all the batches if we have more than one teacher teaching that, so that no batch feels left out."* Similarly, Majan said, *"And for example, if I attend a workshop, I would come back with my colleagues, and I tell them what we learned. So it doesn't mean that all of us have to go, one of us can go and then let others know, how it went, what was a good practice and so on."* Ahmed also shared that working in a team helped in collecting and sharing teaching materials. While Salma highlighted that working without a team makes it challenging to learn and be aware of new technologies.

Collaboration amongst teaching faculty does not only take place within the bounds of an HEI only, rather it goes beyond individual institutions. In this regard Asif and Haya stated that they share and collaborate with educators from various institutes to enhance learners' experience and learn best practices being employed in other HEIs. Nara pointed out that her institute signed a memorandum of understanding with another local institute where they can share knowledge and different teaching methods. Therefore, working as a team significantly contributes to delivering effective entrepreneurship teaching, with the hope that this positively influences students' interest in entrepreneurship. Additionally, teamwork serves as a facilitating factor in technology adoption, as educators share insights and support each other in integrating technology into their teaching practices.

To sum up, it is obvious from the participants that the positive role of the educators in DA adoption is vital. Educators contribute in DA adoption through the following key aspects: First, they demonstrate awareness of the importance of integrating technology into teaching and learning process. Second, they exhibit behaviours such as passion, motivation, and willingness towards teaching entrepreneurship. Third, they take different initiatives to create an effective teaching environment. Finally, they work as a team to gain and share knowledge in matters related to entrepreneurship. The table below provides quotations from participants, underlining the theme of educators as a vital factor in DA adoption.

Table 7: Educators as a vital factor sample excerpt

Educators as a vital factor
"Without DA, teaching or learning cannot take place in today's world. DA is now becoming a very, very important part of our lives because we are living in a digital age. So, we cannot teach anything without it. We have to teach within it. In fact, we have to enhance it more. You know, that's the need." (P1-Laura)
"Actually, nowadays, without digital tools, it is not possible to actually transfer the knowledge to the learners. And so, the IT facilities nowadays are very important to transfer knowledge and actually increase the knowledge of the learners because the learners with the IT facilities can be familiar with the real environment and it is more closely similar to the real environment. Using DAs facilities actually makes the student familiar with the real business environment and how they can solve real problems. So, without using these types of digital facilities, it is very difficult to actually engage the student with the topic." (P15- Ali)
"Without a doubt, using the technology helps the learners understand the concepts of entrepreneurship. And, as they say, a picture is worth a thousand words. So, whatever is very visual will, you know, help learners understand the concepts. And of course, stimulate them about the importance and about the concepts of entrepreneurship." (P17- Haitham)
"Using technology is very important, actually, from my personal experience, I can say that if you have to tell them some concept, and if you really show them, that really makes a difference, then rather just speak it out, it could be like I'm just talking maybe because of a communication gap or something learners may not understand, but when the visuals are there, they can see it, and they can relate it." (P8-Samia)
"Using technology is important, especially with this generation. We need to inspire our learners and encourage them to see real-life experiences. Entrepreneurship is all about real life and learning from other entrepreneurs' success stories or failure stories. So, I think without that, learners would feel a bit disconnected from real-life situations." (P24- Thelma)
"You should be able to share those videos excellently, with the motivation and, of course, the theory that goes with them. So those things, theory and video, have to be well delivered in class, along with a case study, of course. So we repeat the case study. So these things will actually make the class delivery very successful, highly motivating, highly inspirational. I'm using the word inspiration, and that must be the class." (P7- Maya)

"I'm willing to do this, and I think that this should be an answer for all people involved in learning and teaching. You know that willingness to, because if you don't do it, you are not only harming yourself but also harming your learners. Yeah, you know, so we have it; it is the need of the hour. There is no like, or I like what I don't like. That is the question that you have to answer. You must do this you know." (P1-Laura)

"So if the person doesn't have that passion to teach and learn any new technology, they cannot develop. So we get the training, and as well, it is self-development. OK, we need to read and we need to write. We need to listen. So you have to develop yourself. Maybe the training sessions contribute around 30%. And more than 70% is coming from yourself." (P2-Abdul)

"There is something called an intention. The intention of the educator in terms of delivering, for example, sometimes happens like this because the institute wants you to deliver this course, so maybe the faculty member is forced to take this course and deliver it. In this case, there will be no creativity or full intention for the faculty member to deliver it as a full fledge. So there will be some shortage and gap in execution in terms of delivering the right skills or knowledge and building the capability of the learner, while on the other side, if the intention is there and there is a scope for the faculty member and the institute to collaboratively make this happen, then it will be another story." (P27- Mehdi)

"I do an event or a fair—an entrepreneurship fair—at the end of the course. So during this fair, the learners who worked during this four or five months on their business model and their business plan, they would showcase it in like an exhibition. And the idea is so that other people can see their business idea, and I would open it for the public in terms of invites, like the, you can see the organizations that could potentially give them grants to start their business. I invite other entrepreneurship educators as well to see some of their business ideas. I invite all these organizations that host these competitions like Injazz Oman, SME Academy, and other organizations as well. So it was also a very good platform for them (learners) to get immediate responses or feedback on their products before basically, they start to produce mass producing it." (P 10 -Majan)

Inspired by the business model canvas, we host "InVoCanvas" where learners studying the module showcase their business plans on posters. Over 170 groups participated in the event. We then formed a committee to evaluate these posters, selecting the top 20. Subsequently, we brought in another committee from the industry to further assess these

posters. They identified the 8 most promising entries as potential business models. (P14- Hassen)

"We took the learners on a site visit to Oman Telecommunication Company, where a staff member provided insightful information about the telecom centre's operations, emphasising the importance of 5G and the significance of last-mile technologies. The visit was highly informative for the participants, sparking their curiosity and motivating them to further explore telecommunication network concepts. Their enthusiasm for learning about this field was evident throughout the visit. (P15- Ali)

I requested from the learners, as a part of an assessment, is to identify a small local business (SME) and assess it. Look for things like their business plan, marketing plan, and so on, look at the business's strength and weaknesses. By this task, the learners consider themselves as consultants, and give feedback from their perspective to improve the businesses. (P16- Khalil)

"Many times, I actually—usually every month—have a meeting regarding how we can improve the entrepreneurship course. And the educators note down the suggestion, to be given to the management, that whatever practical courses are added to the entrepreneurship programme, they actually increase the benefits and the advantage of the course to the learners." (P15 -Ali)

"When we have a large number of learners, I'm not going to be the only teacher here; maybe we have two or three lectures together. So, we definitely have a shared discussion and meetings to come up with ideas and videos and all that because we want to give the same material to all the learners. So definitely, we have a meeting, we discuss that, and then we provide the videos and other things to the learners. So, we do take an opinion from that, and we have a system of what to say about the moderator's internal verifier, who is there and looks into these aspects as well. And he or she also has to give an opinion about it. And then only will we publish all the materials and videos and cases and case studies and all that." (P12 -Ruksat)

"We do share with other educators. We do share case studies because most of us would like to discuss the same thing with all the batches if more than one teacher is teaching it so that no batch feels left out or that we were not told about this." (P8 - Samia)

"And for example, if I attend a workshop, I will come back with my colleagues and tell them what we learned. So it doesn't mean that all of us have to go; one of us can go and then let others know how it went, what was a good practise, and so on." (P10 -Majan)

"Actually, we have some knowledge sharing sessions between us as teachers, and we also have one day of sharing teaching experiences, an open day, in which we share our knowledge. Educators have many innovative ways of teaching, which they like to share with colleagues. So, they share them during the open day. For example, I have the tool megatrend mark. I can share it with my colleagues; someone else has an Excel program, and he's sharing it with us. So, we got this to share this knowledge together, and we also discuss ways of teaching, especially how to improve the quality of *deliverables*, so in those discussions we can improve our ways of teaching." (P26- Mazin)

"In this college, entrepreneurship is taught as a general requirement course, we signed an MOU with (.....) college, so whenever we require some clarifications in detail about the subject we contact the department staff of that college like sharing information. also, if they're using some new technologies or some other tools, they update us." (P30- Nara)

4.2.3 External success factors

External success factors were one of the main themes that emerged from the data as a significant factor that facilitated the adoption of digital artifacts in entrepreneurship education teaching practices in Oman. Unlike the factors associated with learners and educators discussed in the previous sections, these external factors are linked to management, institutional culture, available facilities, and infrastructure. The following paragraphs will discuss the theme in more detail.

In general, the majority of the participants express satisfaction with the basic technical equipment available in their institutions that facilitates entrepreneurship teaching. For instance, they noted the presence of a reliable internet connection for both educators and learners, which, in turn, opens doors to the use of various technological applications and software both inside and outside the classroom. The participants highlighted their management's commitment to providing internet access to everyone, encouraging educators to leverage free software like Business Model Canvas and SWOT analysis, as Soraya, Salma, Hassen, Arshad, and Ali stated. Furthermore, the availability of the internet has empowered learners to navigate online resources, as mentioned by Salma. Ali was also keen to ask learners to try and download some business games available in Android and Apple stores: *"I actually ask the learners to find games... There are so many games come through the app. So they can go through them, download them in their mobile phones and go through it, engage with the games."* Therefore, the availability of the internet connection inside the classroom has enhanced entrepreneurship teaching.

A good number of participants, such as Hamed, Zahi, Abdul, Haya, and Raiden, expressed their appreciation for the availability of smart boards, which aid in using pictures and videos to explain entrepreneurship-related concepts in an attractive way. Computer laboratories were also available, which allowed learners to meet and work on their business ideas and for educators to take the learners to work on specific software, as Hamed, Khalil, and Hassen said. The latter also revealed, *"So the wide spread of technologies that why encouraged me to use these kinds of a new tools, or instruments or technologies."* Other facilities were also addressed by respondents, such as the availability of an e-library, as Ibrahim stated, a service that learners can use to access online books, and case studies. Majan also said that cloud services are also available to upload different materials to be used by learners.

Institutional managements around seem to be very supportive in providing new required infrastructure and technological tools to their teaching faculty. Soraya affirmed that the management of her institution asks educators to request for specific technology that can

facilitate their teaching practices. She asserted that management support is there to provide what educators may require for their teaching practices. Harley and Nara shared the same notion about their managements. Mazin also stated that if the request is justified, then the management is willing to provide the requested facility or software. He mentioned that the management of his institution is supportive in this regard.

Availability of technical support came as an important area from the analysed data and respondents highlighted its availability as well. Abdul was appreciative of the technical support available to him and mentioned that *"We have at the university, a good team that they support any kind of things we need, like if we'd like to get any software."* Bala also confirmed that educators are mentally at peace as they know whom to contact in case of a technical issue. He also noted that there is an e-learning department in his institute that is responsible for digital matters. This department provides training to educators, identifies and experiments with different software, archives digital documents, and offers technical support. Mazin also highlighted that the management provide training on how to use digital tools. He also noted that they are even keen to offer paid training for the staff. Nara added that it was only through the training provided by the institute that she gained confidence in using Canvas. She stated that the software has helped in saving time in preparation for classes: *"I got the training for Canvas and once I learned how to use it, it was amazing. My work, you know like 50% was reduced."* (P30- Nara)

The availability of technical support is another factor that facilitates the adoption of technology in entrepreneurship teaching. The fact that there are proper digital facilities and support from the technical team motivates educators to experiment and utilise different technological software because, if something goes wrong, they know that support is there.

The presence of an entrepreneurial culture within institutions facilitates the adoption of digital technology. The respondents affirmed that when their management has a comprehensive understanding of the potential benefits of entrepreneurship, they tend to be positive and supportive towards anything related to it. For example, Majan confirmed that her university provided all the necessary support when she proposed the idea of organising an entrepreneurship exhibition:

I wanted to do this exhibition, mind you to do this exhibition, and I have to involve the whole university. I have to empty the whole corridors and everything in the rooms. So it involves a lot of effort. And if the university did not support me, they would say why are you doing this? You don't need to do it. What is the point? You know, what is going to happen after that? You're wasting our time or efforts and so on. But no Thankfully, they share my vision. So, the atmosphere or the environment of the university itself, you

can see also, the vision of the heads of the university also plays, I think, a very important role. If they share your vision, then it's very easy for you to do with, basically, how you wish to do it. (P10- Majan)

Majan's experience exemplifies how the presence of an entrepreneurial culture enables educators to implement ideas that require the support of the entire institution. An educator cannot implement an idea alone; they require the support of others, and the management's support is of the utmost important in this regard. Availability of entrepreneurship culture is also reflected in the idea of launching new programmes, (pathways) of entrepreneurship, as Hassen and Raiden shared. Hassen, for instance, elaborated that when the management values entrepreneurship, the institute goes beyond delivering a compulsory course to offer a degree in entrepreneurship, where possible. This is a step that some higher education institutions are willing to take, which infers that entrepreneurship is important to the Omani economy and that there is a requirement to teach learners as to how to be entrepreneurs through a comprehensive educational approach. Haitham also asserted that the management plays a vital role in spreading the entrepreneurship culture, and he considered entrepreneurship as an investment that managements should invest in:

See, I look at it as an investment that is made by the college or university management, it depends on how much they are investing, how much they are committed. So I think it's it mainly depends on the management commitment, you know. Like, how much they are investing, and, Of course, it should be rooted r should go back to the strategies and the vision and mission of the institute's, how much importance is given to entrepreneurship, and how much of course financially they are willing to give. (P17- Haitham)

In addition, a number of institutions have started offering incubators and centres for entrepreneurship with the goal of implementing entrepreneurial ideas and starting businesses, as Ruksat, Haya, Abdul, and Majan confirmed. Incubators in higher education institutions offer learners a safe place to learn, test their innovative ideas, get mentors, and after a while, launch their products or services to the public.

Therefore, the proper digital facilities, technical support, and the availability of entrepreneurship culture within the institutions can be factors that may facilitate DA adoption. This can occur through the managements' understanding and support to any matter related to entrepreneurship. The table below presents a list of responses which address the above-discussed theme of *external success factors*.

Table 8: External success factors, underlying dimensions, example excerpts

External Success factors
"Here, we have almost all the facilities when it comes to computers; we have even smartboards, you know, and we have projectors. So we have all the required facilities, even the internet and the connection, and we even have some labs. You know, if we need to use certain software, let's see what applications we can take our learners to in the labs. We have almost all the facilities to use what we call the digital artifacts here." (P13-Hamed)
"Here, the internet is available; each one can login to the internet anywhere, for example; we are equipped with all the requirements, whether labs or even Wi-Fi networks, so me and my learners can, for example, use these technologies. And also, you know, the available resources that can be used for free on the internet. So, for example, Business Model Canvas is free, and you can, for example, use Google. share documents, for example, in order to let all the group and all the learners work together and at the same time online and develop something that at the end will be valuable for them." (P14-Hassen)
"Yeah, one is the availability of the Internet. That is one, and now we don't have any restrictions on the learners. Today, the learners have device access, and it's connected to the college network, so because of all these reasons, their own interactivity allows me to see physically who is there, and I just project, for example, MS Teams. I have these kinds of channels available for these groups, so every group post interactively in real time and I'm able to see it. So this is one and the Moodle platform we have for summing up. So for the scaffolding, I use it for building up the momentum and helping capture what they have completed in a single lecture." (P4- Bala)
"We have classrooms with smartboards, a library facility is there, and an Entrepreneurship Club is there that is participated in by learners, and one mentor has been provided by the college. So through this club, learners organise events like exhibitions, videos, and this type of activity. Third, it is through their home assignments that we identify some sources and tell learners to use them as a template for their assignment. So, in this way, we provide them with an opportunity for independent learning." (P3-Zahi)
"We had smart classrooms smart board, that is what the so for me, using PowerPoint videos, the audio system was a big class had speakers, not only laptop speakers, but external speakers, which were, you know, good enough for learners to hear even in the back end of the classroom." (P9-Raiden)

"The biggest fear that I have as a faculty is like what if everything goes away and disappears. So you know that is a kind of thing. So that confidence is given by the tech team, the technical team behind. So I don't bother too much about the technology part because of the technical support team." (P4 -Bala)

"So it's obviously very good that we actually have a very good internet connection, obviously. In the university, we have this cloud that supported us uploading all these very big documents, videos, or lectures; basically, we have all the tools that we needed in Microsoft Teams, so we did purchase the software to use so that we have all the unlimited tools to use during our sessions." (P10- Majan)

"Here, we have, let's say, as a private university, we have better tools. You know, we have better facilities. We can get whatever we require in our classroom; we just need to justify this, and the university is also encouraging innovative ways of teaching and using mainly digital learning tools, digital pedagogical tools, and entertaining learning tools." (P26- Mazin)

"We have a smartboard, we have computer labs, and I don't know if this is something related to that; we have, of course, our sound system in the class, and that helps when I present a video. And sometimes I send the learners to the library and to the labs for different activities. We have Moodle, and I load the materials that the learners want to see on it. Like I want to upload PDF files or case studies or some pictures that I uploaded on Moodle." (P6- Haya)

"Now, most of the institutions, especially in Oman, tend to actually push and invest to spread the culture of entrepreneurship. Not just by teaching the course of entrepreneurship, but many institutions now even started launching whole programmes for teaching entrepreneurship in their institutions, and some of them have now established the centres, taking care of entrepreneurship and also concentrating on research related to entrepreneurship. And also, they started incubating." (P14- Hassen)

"The culture itself of the university here is so unique that I'm given absolute freedom to teach it how I want; the most important thing is that I follow the curriculum; all of the content I develop has to meet the criteria and the learning outcomes; how I deliver this is completely up to me. So this is, I think, what motivates me a lot: I have the freedom to do it, and I enjoy doing it because I have the freedom to do it. If I want to bring guest educators in, I bring them." (P10- Majan)

"We got approval for an undergraduate degree programme in entrepreneurship from the Ministry of Higher Education and Innovation. So, to me, that indicates that the seriousness

and awareness have increased, that there is a demand in the market, and that people would like to actually study in detail and become entrepreneurs." (P9- Raiden)

"Now we are doing a business incubator. We established this in January. I am currently the only employee in a business incubator, and we have completed the pre-incubation stage, begun the selection stage, and are now, exactly at the beginning of the semester, at our first step on the incubation stage. It is currently only for learners and employees, but we intend to expand it to the general public after two years." (P6- Haya)

"Yes, I have attended some training sessions. I have also attended some training sessions, mainly in the design thinking approach, and also in some courses related to entrepreneurship education. For example, we can apply for attending training related to entrepreneurship, and we have a lot of teachers who have applied for attending some workshops, interestingly, even paid workshops. Yeah even paid workshop, and they can get approval for that we can also." (P26- Mazin)

"The management is very supportive if I want any kind of reference, books or technology, or if I want to take my learners out on a field trip, if I want to invite anybody to the college, or introducing any kind of thing that helps learners to learn better, management supports at any level." (P29- Harley)

This section delved into the first stage of DA adoption process through highlighting the factors that facilitate the adoption of digital artifacts in entrepreneurship education. 'Building the Foundation' encompassed three second order themes including the current available DAs, and the learners of the current generation, the educators' role, and the external success factors. The following section will discuss the second emergent dimension, highlighting the factors that impede the adoption of digital artifacts in entrepreneurship education in Oman.

4.3 Diagnosing the Obstacles

Within this section, I address the second emergent dimension of DA adoption process. Subsequently, I present the different factors that participants highlighted as impediments to digital artifacts' adoption in entrepreneurship education. After analysing the participants' statements, I identified three major categories of impediments: the learners, followed by the educators, and the management and infrastructure. The following paragraphs will highlight each factor in detail.

4.3.1 Recipient as hindrance to digital artifacts adoption

As per the received and analysed data, learners emerge as a significant impediment to the adoption of technology, as several participants confirmed. Some learners lack understanding and awareness of the importance of incorporating DA into education and learning, leading them to be passive and disengaged in the learning process. Different interpretations of this behaviour have arisen among participants. Hassen and Mazin, for example, attribute this to the learners' background. Learners at primary and secondary school levels typically have limited exposure to technology in their learning processes, relying more on educators and books as their primary sources of information. This mindset tends to persist when they enter higher education. Mazin, for instance, stated: *"They (learners) have not been accustomed to research, and to focus on dependent learning, you know. I think this work that been missed out from the primary school."* Nara also emphasised the lack of awareness among learners regarding the available technologies that can enhance their studies or businesses. Hassen underscored that entrepreneurship is taught as a compulsory subject in the third or fourth year. The rationale behind this is that, by this time, learners are expected to have acquired basic skills, including using computers for learning processes and research. It is hoped that, at this stage, their mentality toward technology has changed. Hassen considers teaching entrepreneurship during the first or second year a mistake, as learners might not be adequately prepared or receptive to it at that stage.

Zahi, Khalil, Hamed and Seema also asserted that learners can be a main barrier to technology adoption. For example, Zahi revealed:

The first barrier is the learners. In my case, learners are not familiar with these methods of teaching; their perception of teaching is the traditional classroom setting. We, as educators, are either the source of information or they're reading from the books. (P3- Zahi)

Hamed added that generally, learners are *"used to listening to teachers; they are a little bit quiet; they don't want to participate. They want to get everything from their teachers."* Dealing with such behaviour from learners can be challenging for educators who value active engagement and participation in the classroom, especially for those aiming to employ diverse teaching strategies, including digital technologies. Khalil identified learners' characteristics as the primary factor hindering technology adoption, noting their general lack of receptiveness and reluctance to embrace technology and educational games. Laura shared similar sentiments with other participants and sought to understand the reasons behind learners' hesitancy to use technology, prompting her to investigate the matter further:

I did a bit of my own study to understand that. We are not training them enough in school, at the school level. You know, so the ones who come from a different school system, where most of the work that they have done using technology versus learners who are most still using paper-based learning than technology, so that is the gap that I find. (P1-Laura)

The findings from Laura's study indicate that learners' backgrounds contribute to their hesitance in using technology. She confirms that learners need to become "technology friendly" because *"they will think differently and become better entrepreneurs if they are comfortable with using technology."* According to Laura, using technology not only aids in learning but also plays a pivotal role in altering learners' mentalities, preparing them for the demands of entrepreneurship, where technology is integral to various aspects of business.

Bala also highlighted that entrepreneurship is crucial to Oman. As many learners graduate every year, and finding a job is not always easy. Therefore, entrepreneurship is one of the solutions. Alongside this he also observed that learners are not ready yet as well, as they still lack the characteristics of an entrepreneur, such as risk-taking and confidence: *"Learners are not willing to take up the next level of growth. You know, they don't want to, like, pitch in. They don't want to put their idea to the test to see what happens next."* (P4- Bala)

Zahi diagnosed the issue as being due to the learners' mentality of prioritising passing and grades over anything else. Learners want to pass the module without valuing the knowledge that they can gain from such courses. Zahi narrated:

Learners are hesitant to embrace such tools (digital artifacts). The problem here in Oman is that the main focus of the learners is to pass with good grades, have a certificate, and then look directly for jobs. So, after building up a career and preparing themselves before the career, this understanding is I can say that this is weak, or you can say it is at the very initial level. (P3- Zahi)

Ruksat, Mazin and Hana echoed the same issue about learners, that some want to finish and pass the course. Zahi, interestingly, elaborated that even the "hard-working" learners' mentality is still not geared towards entrepreneurship. He elaborated:

For example, I will tell you about my personal experience. I interviewed or tried to get the core thinking of some of my good learners. So they have two conceptualizations. Either they want a good job as their first priority, or, if they are thinking about the business, they are thinking to become Saud Bahwan (a famous Omani entrepreneur) by the next day. So, this is the gap. So alternative economics or, you know, a personal career in the field and, before the career, equip yourself with some skills and knowledge, so this conceptualization is actually lacking. (P3- Zahi)

The above excerpt also points out to another issue which reflects a whole mindset on part of the learners. It shows that becoming an entrepreneur is not a priority for learners, moreover even if they want to become one, they want to get overnight success, which is a non-realistic approach. This shows that learners have incorrect ideas about entrepreneurship, which may affect their mentality, understanding and learning approached to entrepreneurship. This in turn becomes a barrier big enough for the educators to engulf.

To sum up, approximately eleven participants underscored that learners' backgrounds, mentalities, and awareness of adopting technology in entrepreneurship pose hindrances in applying and using DAs in the learning process. Learners often struggle to engage actively in the learning process, holding the expectation that educators should provide all necessary information for passing the subject. This situation suggests a need for concerted efforts to shift learners' mentalities. The table below features some of the participants' quotes highlighting the above topic.

Table 9: Recipient as impeding factor sample excerpts

Recipient as hindrance to digital artifacts adoption
"And also, the background of learners, because sometimes if learners are struggling, for example, with using the new technologies because they are not aware or they are still in their first year of the academic programme, it is considered a barrier.... If you are just coming from the foundation directly to study entrepreneurship, I think it will be considered a barrier." (P14- Hassen)
"The first barrier is the learners. In my case, learners are not familiar with these methods of teaching; their perception of teaching is, you know, the traditional classroom setting. We are the teachers is source of information, or they're reading from the books. Learners are

hesitant to embrace such tools. The problem here in Oman is that the main focus of the learners is to pass with good grades, have a certificate, and then look directly for jobs. So building up a career and preparing themselves before the career, still, this understanding is I can say that this is weak, or you can say it is at a very initial level." (P3- Zahi)

"Number one as a hindrance is the personal characteristic of the learners, because those learners are not receptive; they are not, and they don't have the willingness to accept the usage of those materials. They are not willing to take in the using games and those stuff. We are trying to use the case studies. They are not interested. they just very traditional way of teaching it. For me, I it's not comfortable. I'm not comfortable with the way of teaching it" (P16- Khalil)

"Learners are not ready; they are not ready everywhere it happens that they are not ready to take technology or otherwise. They are not paying attention, so whatever you do, they are not ready for it. So, I feel that even with technology, they are not accepting it easily." (P8- Seema)

"A main barrier of not using technology I think is the awareness the learners. There are some digital things that are available in the society or in the market that they can utilize for their studies. If they don't know, of course they are not going to use them." (P3- Nara)

"We have not, I mean worked enough with the secondary school and primary school on the creativity of the learners, you know. We have accustomed learners to the conventional pedagogy, to the conventional knowledge, where the teacher has the knowledge, all the knowledge, and the learners will get this knowledge from teacher. They have not been accustomed to the research, and to focus on dependent learning, you know. I think this work that been missed out from the primary school." (P26- Mazin)

"Entrepreneurship course should not be restricted to marks-based assignments. This is one thing I feel like maybe restricting them to just do for the sake of getting marks or completing the module and getting a pass. Sometimes we have some learners who just want to complete this; they're not much interested." (P12- Ruksat)

"Not all of the learners are enthusiastic to bring something interesting, you know. They just want to pass and finish the course, so I try my best to make them excited." (P21- Hana)

4.3.2 Educator as an impeding factor

This section will cover the data from the participants, which revealed that educators are a vital factor that impede the adoption of digital artifacts in entrepreneurship teaching practices. Participants reported different issues, such as the educators' teaching styles, teaching workload, educators' awareness and understanding of entrepreneurship, and their incompetency in teaching the subject. The following will highlight each issue in detail.

One main issue with teaching entrepreneurship is that it is taught in a traditional manner, where educators depend mostly on lecturing, primarily using PowerPoint slides. For example, Haitham reported that currently, teaching entrepreneurship is traditional and limited to the use of pictures, videos, and lecturing. He said: *"So much of our teaching style, we are not that creative in our teaching style. We are still using the classical way."* He stated that there is no creativity in their teaching of entrepreneurship. Haitham exhibited that *"because maybe the course teachers here feel that they can handle the course without having these simulations, or whatever, you know, just by discussing with learners or by explaining, for example, the visibility study, the business plan, that's why maybe they are not really paying more and more attention to these (digital artifacts)."* Haitham confirmed that using technology is important and beneficial to the learners, yet in reality, it is still underutilised. He also explained that maybe because there were no clear directives from the management that insist that educators use technology, therefore, educators are not doing so. Ahmed also mentioned that use of traditional methods is common, and that changing educators' mentality is a difficult task.

Hana stated the same notion. She considered herself even an 'old school person', but also articulated that her personal life prevented her from learning and acquiring new ways of teaching. *"I don't know. Maybe I'm an old-school person. I prefer paper-based quizzes; you know, I'll print a quiz for them to assess their like characteristics entrepreneurial characteristics, I do that sometimes as paper-based, but technology, I'm not that much into technology. Maybe I don't have time because I have family and kids. I should give it more time."* Hana explained that using hard copies, and using technology in class require learning and preparation, but her current situation does not seem to allow her to do so. Hana's idea could align with Haitham's, as it is not compulsory to adopt different teaching strategies, and therefore, educators do what suits them, following traditional methods where educators explain and go through PowerPoint slides that have already been prepared. This also aligns with what Khalil and Zahi stated, that the management itself does not mind teaching entrepreneurship using the traditional way.

The traditional way of teaching i.e. lecturing implies that the subject is predominately taught in a theoretical manner. In fact, some participants indicated that entrepreneurship is 70% taught theoretically, as indicated by Thelma, Laura, and Arshad. Laura stated that her theoretical teaching is 80%! Rushdi expressed that theoretical teaching leads learners to be bored, and their attention decreases: "*... and the moment you go and teach, you put on the slides, and you put on the theoretical part, straightaway, learners get bored; they will focus with us for a few minutes, and then you will lose their attention.*" The traditional way of teaching is still common despite educators being aware of its disadvantages for learners.

Participants like Laura, Ahmed, Hassen, Rushdi, Hamed also found that educators' awareness of using technology is still not to a satisfactory level. Hassen, for instance, elaborated on educators' awareness of using technology. His idea is that educators need to be aware of what is going on around them, offline or online, regarding the different events or programmes that can benefit educators and learners on topics related to technology and entrepreneurship. If they are not aware of the developments around them or do not update themselves, then this can also affect their effective teaching of entrepreneurship, as he explained in the following excerpt:

Another important thing is about the awareness of using technologies, how you are aware, for example, of new programmes that will help you deliver the course smoothly and make it more attractive to your learners. Also, you have to be engaged with society, because there are, for example, many institutions that are actually within the entrepreneurship ecosystem, providing, for example, competitions, training programmes, and workshops, which may help you actually develop your self-interest. And also, you can ask your learners, for example, to be engaged in one of these activities, but if you are not aware, if you are not following, for example, these things that happened around you, you will struggle a little bit, and if you are not engaged in following the new trends in the economy, social media, or technology, you cannot give your learners the best way on how to, for example, identify the opportunities and then reach or generate valuable ideas. (P14- Hassen)

Mehdi also emphasised that learners nowadays are competent in using technology, and if the educators are not up to date, then this can create a gap between the learners and the educators, which can impact the effective teaching of entrepreneurship:

Nowadays, we find that the learners are smarter when using technological devices, and this makes it again challenging for the faculty member if he or she is not connected with the updated technology and the digitalisation transformation of tools and the content that is used. Again, here, there will be a gap. (P27- Mehdi)

Another reason revealed by the data is that educators can be an impeding factor due to a lack of proper training and/or qualifications. Many educators are not specialised in teaching entrepreneurship. Mehdi acknowledged that, while the entrepreneurship educators at his institute are competent to a degree, they require further development to effectively teach the subject. This is because the course demands more practical experience beyond just theoretical knowledge. Abdul highlighted the difficulty of finding experienced and qualified entrepreneurship educators in Oman, a challenge commonly faced by HEIs in the country. Hamed and Haitham reported that in their institutions, not a single educator possesses a qualification in entrepreneurship. Despite having a substantial number of learners studying entrepreneurship—no fewer than three thousand—educators lack qualifications related to entrepreneurship. Hamed, elaborated:

The problem here is that we don't really have any people who are specialised in this area, for example, someone is specialised in accounting, but he or she can teach entrepreneurship, and I am in HRM. But I have to teach entrepreneurship. Even this time, I told them, I don't want to teach it. I want to teach, for example, another common course, which is business ethics. And they told me, Hamed we don't have really enough teachers to teach this course. You know, even sometimes a new teacher is really scared to teach the course; they said it's not our major. You know, someone in marketing or operations management or supply chain management, or, let's say, finance and accounting, you know. So that's why, actually, they are not really into that area. (P13-Hamed)

In higher education institutions in Oman, it appears that specific qualifications related to entrepreneurship or, at the very least, mandatory training are not prerequisites for educators to teach entrepreneurship. In fact, educators without a background in entrepreneurship can teach the subject, as Hamed indicated earlier. More concerning is the fact that some educators are forced to teach the subject against their preferences, as highlighted by Hamed. He revealed:

"And even some of them are not really interested in teaching the entrepreneurship course, but someone has to teach it because we have a large number of learners who take this course. So, some of them, even in this semester, teach three sections of entrepreneurship because there was no way, you know, so I feel like some of them are not really interested. They are not really qualified enough to teach an entrepreneurship course, but there is a shortage of stuff. And they have been asked to teach it." (P13- Hamed)

In such cases, institutes try to find anyone who can manage the subject instead of considering interest, motivation and qualification as a ground for deciding in favour of a specific educator. Other quotes from the participants highlighting educators' competency are shown in the table below.

As stated earlier, entrepreneurship is still relatively new in Oman, and the Ministry of Higher Education, Research and Innovation with other bodies have offered some training to qualify educators to teach entrepreneurship, yet it seems that many have not had a chance to attend any, and the result, as Haitham presented it, is: *"Everyone's teaching this course from his background; nobody specialises in entrepreneurship; we have some people from an accounting background, someone from a marketing background, who are specialised in different programmes, and everyone is using his style."* Hamed, on the other hand, ended with the following wish: *"I hope that one day we'll have those people who are really specialised in entrepreneurship. So that they can really make a difference. They can add value; they can share their experience, you know, compared to those who are not specialised."* Raiden expressed that the issue of competency is not only common in Oman but even in other countries, such as the UAE:

Competency of faculty members themselves, now, we were lucky, Mr. Salim, to be part of that course (Certified Entrepreneurship Educator), but not everybody, if you speak to everybody who is teaching in Oman, might not have been, you know, given a chance to educate themselves to certify themselves to be entrepreneurship educators. Unfortunately, this is not only in Oman but all over the world. I see now in the UAE that there are teachers who have never taught entrepreneurship before and who have never run businesses before. have no entrepreneurship field experience, research experience, or teaching experience. This is a big hindrance to further development of the field in universities and colleges. (P9-Raiden)

Nevertheless, if Oman wants to produce more entrepreneurs, there is a lot to be done, and improving the qualification of educators will stay to be vital. Quotes presented above by Hamed, Haitham, and Raiden indicate that many institutions allow anyone to teach entrepreneurship, yet they may not allow anyone to teach accounting or finance, for example. This could reflect on how important do institutions feel entrepreneurship is in the current frame of things. The result is that anyone can teach it, as expressed above. Out of the 30 interviewed participants for this study, 18 educators do not have a qualification, i.e., a Master or a PhD in entrepreneurship.

Participants like Shamis, Haya, Ali, Thelma, Khalil, Laura and Hamed expressed their concern regarding workload and considered it an impediment to technology adoption. Hamed elaborated that, beside the lack of competency, educators are overloaded, and therefore, they are not willing to learn new teaching methods:

I think here about our colleagues; you know, maybe they don't really want to use something new. And then they have to learn about it, how to do it, or, you know, they just want to finish the class because there is a high workload, Salem, you know, 18 hours, some of them even 20 hours, you know, so they

don't want to burden their heads they have to learn something new or using new digital tools to use it. They said, let's, let's use the same we have the course material, we have the PPTs. We have what we call a business plan template, a visibility study template, and case studies also, you know, by that way, so they feel we can use this to deliver the course without maybe utilising any digital tools, you know; maybe they think in that way, I think, yeah. So I feel Yes, there is a real need for the use of digital tools. But as I said before, here, because of the workload and other things, we are not really trying to learn more and more about digital tools; we just go there to deliver the class. (P13- Hamed)

It was also highlighted that learning technology and preparing for its implementation in classes require time to learn and master it. Nevertheless, if educators are overloaded with various tasks and commitments, it can pose a considerable challenge. Khalil, for instance, complained about the workload in his institution indicating it as a factor that impedes the adoption of technology. He stated: *"Teacher workload, this is very important. We in the university here are experiencing this, and sometimes we do have a very high workload. So we don't have time to use them (the digital artifacts)."* Haitham linked lack of creativity to workload, justifying that if educators are overloaded, they may not dedicate time to prepare creative activities in class, but instead teach the subject in a more traditional manner. In fact, it is expected to be difficult for educators to learn new tools to adopt in their teaching if they are having a teaching load of 18 to 20 hours per week, on top of all the other responsibilities like marking assignments, class tests, and final exams, plus the other administrative work they typically have. The table below presents participants' quotes highlighting the topic above.

Table 10: Educators as an impeding factor sample excerpt

Educators as an impeding factor
"Sometimes the institution itself is not supportive of using different digital artifacts; they just say, Deliver, and that's it; you can use the traditional way of teaching; there's no need to be innovative and use those tools. Yeah, so those are possible hindrances for not using DAs." (P16- Khalil)
"Still, institutions, at least in Oman, are in a belief of, you know, the traditional way of teaching: speaking and listening and doing some work on content and going for exams and passing and taking care of grades only." (P4- Bala)
"We have to really create a culture of entrepreneurship; we have to create a course, as you said, with more and more awareness, especially among the teachers who are really interested in teaching an entrepreneurship course." (P13- Hamed)

"So, it is very important that we do not just concentrate on the, you know, one part that those who know, but we also need to create awareness and maybe also instruct or train people to use DAs. So, creating an awareness training in using DAs is very important." (P1- Laura)

"Some educators are still using the traditional way of teaching as a habit; you know, they can't change it easily. So to change people's beliefs, habits, or teaching methods, it's really difficult to be honest with you." (P25- Ahmed)

"So, here even I can see it; you know, teachers just want to finish their classes. They don't want to really to, I'm not saying all of them, but some of them, you know, just want to deliver the course that's it. It doesn't matter you know, whether they use newer systems or all systems New techniques or even or techniques, as long as they can deliver the course, that's it?" (P13-Hamed)

"Also, the educator himself or herself has to be equipped with the skills to make use of these digital artifacts." (P11-Rushdi)

"Finding an entrepreneurship educator in Oman is a challenge. There is a lack of competent educators who can teach entrepreneurship. Every semester we face this challenge, finding someone who can teach learners, or mentor them. Though there is a growing interest by the government and policy makers, there is a lack of competent entrepreneurship educators." (P1- Abdul)

"If someone is overloaded with, you know, teaching hours and responsibilities, and so this might affect your ability to be creative or to have the time to be creative, Sometimes, you know, it depends on the nature of the work—not because you don't believe in its importance but depending on the situation." (P17-Haithem)

"Some teachers are not supporting the usage of those materials or tools. Either they are they don't have the technology skills to use them, or they are not, they don't have the experience to use them. Or they have, like, a very high workload." (P16- Khalil)

"I was busy because till last semester we were teaching 20 to 22 hours a week. It is only from this semester onwards that we are only restricted to 16 hours, 16 to 18 hours. Yes, workload is always there. There's so much of admin work also to be done. I've been working in academic advising in the ERP system, because everything has to go through the ERP system, so there is a lot of admin work in that matter." (P1- Laura)

"This is one of the main challenges we have here because, as you know, the workload or the teaching load is really too high. Yeah, it's a lot." (P28 -Shamis)

This above section elaborated different issues related to the educators as an impeding factor to DA adoption. It covered areas such as teaching style, teaching competency, qualification, and workload. The following will explain the role of the management as an impeding factor to DA adoption in EE.

4.3.3 Absence of management support and resources

While participants pointed out that learners and educators are factors that impede technology adoption in entrepreneurship education, their institutions' management are also found to be another crucial impediment, as will be explained below.

Some educators expressed that even if they were willing to use innovative ways of teaching and incorporate technology into their teaching practises, there were other external barriers that prevented them from doing so. Hassen and Haya, for example, stated that in entrepreneurship compulsory course, the number of learners in each class was very high, which prevented them from interacting and assessing business ideas effectively. Educators found it difficult to sit down and discuss the business ideas with the learners in detail and suggest improvements. Hassen said:

One educator cannot deal with, develop, and use the most available tools to, for example, teach entrepreneurship with many learners because you need to concentrate on the learners in order to follow them. It's not about generating ideas; it's about choosing the right idea; it's about testing the ideas..... with many learners in each class, you will struggle to deal with them. (P14- Hassen)

Several participants expressed the idea that their management neither provides nor encourages educators to adopt up-to-date technology. The management just wants the course to be taught, regardless of the outcomes. Khalil, for example, stated: *"Sometimes the institution itself is not supportive of using this (digital artifacts); they just say, like, deliver and that's it; you can use the traditional way of teaching style; there's no need to be innovative and use those tools."* Khalil also confirmed that *"most of the institutions that I have come through do not care that much about using different teaching methods."* He added that management may implicitly encourage the use of technology and any other innovative teaching style, but when it comes to reality, there is no real support from them. Zahi expressed that the management does not seem to understand the value of entrepreneurship or the way it should be taught: *"This is a question. Do they (the management) have the right understanding of the*

way to deliver entrepreneurship education, different from the traditional one?" Therefore, their lack of understanding of the value and importance of entrepreneurship is reflected on the way they consider it.

Haitham justified this by stating the fact that entrepreneurship is still recent in Oman and that decision-makers may not be familiar with it: *"Maybe, you know, decision-makers, because entrepreneurship as a concept hasn't been here for long; it's quite new. So, everyone, especially those who are actually in their end of career time, may not be fully aware of, or up to date with, entrepreneurship."* However, this attitude from the management has resulted in discouraging the educators from taking initiatives, as Rushdi and Khalil pointed out. Their argument is that if the management is not supportive and does not provide what we think is beneficial for the learners, then why should we bother or request for specific digital tools? The educators' argument is that if there is no support from the management, then most probably new tools including DAs will not be provided. Khalil narrated: *"They (the management) don't care about it. I don't think they care. So that, as educators, why should we bother ourselves with something that is not promoted and that is not, you know, encouraged by the institution itself?"*

Zahi also pointed out that the value of entrepreneurship is still not comprehended, not only by the institutions' management, but also by the Ministry of Higher Education. This is reflected in the seats that the Ministry offers to learners for a specific major. Generally, according to their grades, learners are assigned to a certain specialisation. However, Zahi explained that this cannot be the case for a major like entrepreneurship, where learners are taught 10 to 12 core courses, all related to entrepreneurship and starting a business. Yet these learners may not be interested in starting a business, and instead, they aim to get employed in the government or private sector. Learners cannot be forced to start a business if they are not willing to, and therefore, such 'limited' seats should be offered to those who have an interest in starting a business, not to be offered randomly. Zahi elaborated:

A course is designed as a bachelor's degree in entrepreneurship where learners take 10 to 12 core courses. In such a programme, learners' enrolment must have a prerequisite or pre-qualification criteria, and preferably, the institution must only accept those who are really willing. For example, a student has applied to the Ministry of Education for the sake of degree to secure his future for employment or in any field where he can secure his economic future, so the ministry gives them a scholarship and sends them to any college. For example, they send learners to my college without asking if they are willing to take this education. Maybe that student is very good for sociology... resources should be deployed at the right person who has an intent to go into this field. (P3-Zahi)

Hamed disclosed that his institution's management only became interested in entrepreneurship after a nearby institution won first place in an entrepreneurship related competition. The management wanted to know the winning institution's secret behind winning the competition, which may reflect an interest in commercial competition rather than giving due importance and value to the specialisation itself. As Hamed explained:

When (.....) got the first place, they had one student company called (....), and they got the first place. Now, all the people here are talking about that. And what they did exactly was, because of this, the management here started thinking: What is happening here, why are other institutions doing very well in entrepreneurship but we're not doing? because they have seen some institutions are doing very well, and now they are trying to yes, to push, but before that, there wasn't really any attention to this. (P13- Hamed)

Hamed also elaborated that there had been no one assigned as a focal point in the entrepreneurship and innovation department for almost two years, but after the incident of the competition, the management assigned a person to that role. Hana also noted that if there were any initiatives or entrepreneurship activities, they were solely initiated by the educators themselves; no one from the management seemed to pay attention to entrepreneurship other than the educators themselves. She articulated:

I've seen individuals discussing entrepreneurship, but I haven't seen the head of department encouraging us or giving us, like courses or nominating us for external workshops, so we can learn and see what others are doing, and we can adopt their ideas and their means. I haven't seen very serious work, but I have seen the efforts of individuals. (P21- Hana)

From the examples above, it is evident that there is a lack of proper understanding of entrepreneurship, and thus the due importance the field requires to be given does not seem to be there. Rushdi summarised what is initially required to propel entrepreneurship forward in Oman as follows: *"So I feel, we have to really play a key role; we have to work together; the department at the university level and the academic department can sit together so that they can really work together to create a culture."* It would be beneficial if the different stakeholders come together and engage in discussions on the topic of entrepreneurship. That could be a starting point for raising awareness and promoting entrepreneurship within academic institutions, ultimately benefiting the learners. Thus, a number of participants raised the issue of the mindsets of the three main players: the learners, the educators, and the management. Participants agreed that something needs to be done to change and cultivate mindsets that actively support entrepreneurship and paves the way for its integration into higher education institutions. Additionally, fostering a mindset that embraces the adoption of various digital artifacts beyond pictures and videos is considered fundamental to teaching entrepreneurship. Khalil, for example, narrated:

I think it's the mindset—the mindset of the management, the mindset of the educators, the mindset of the learners themselves—you need to work hard here in Oman. From my experience, I think we need to work harder on the mindset issue. I mean, even the learners, teachers, and management—those three parties—are not willing yet. Students are unwilling to participate in games and other activities because of their mindset. They are not interested; they just prefer the traditional way of teaching. For me, it's not comfortable. I'm not comfortable with the way it's being taught. I mean, that's why I started using lots of videos, lots of images, and lots of examples—for example, I told you about the coding and sort of gaming there. For me, I love it. I love it. Because I see how effective they are. And they do add like a good atmosphere to the classroom. (P16-Khalil)

In order to create the required mindset, both the management and the Ministry need to take the lead. Many participants were of the opinion that this requires a top-bottom approach where both the mentioned stakeholders will have to play a proactive role for realising any kind of change in the current situation. Ibrahim highlighted that direct action from the institution's management or from the Ministry will bring about a positive response, and therefore, meaningful change can occur. Ibrahim confirmed: *"I feel that when there are government directives, when there is government monitoring of a college or university, then they take it very seriously."* Khalil, also, elaborated:

I think we need to start from the top down. So the top management, and even not the top management, even at the level of the ministry, needs to promote innovation. Part of innovation is using technology, involving technology within as solutions for innovation, and from innovation, we can have very unique entrepreneurial ideas on that stuff.... But now, even in terms of the teaching styles and within those tools within the teaching, they need to also ask, or at least put one of the criteria or measurement criteria for the institutions, of how much or to what extent the universities and colleges are using technology and various technology tools in their teaching. So the addition of this criteria or measurement criteria as a standard, which is measured by the ministry or by external bodies, will at least give some sort of push to academic institutions and to educators to use them. This is one way. This is one way. (P16-Khalil)

Khalil was emphasising the mindset of the different parties, yet he believed that it had to come from the top, whether the Ministry or the management for realising the intended change. This notion is based on the fact that directives from authorities will force people to follow. It was also interesting to see that Khalil had mentioned the word mindset ten times during the interview. Ibrahim, who also mentioned it eight times in his interview, explained that in order to create the intended mindset, a number of things can be done, such as:

Talking about national priorities and talking about Oman's vision 2040. So, when the management of any college or university feels that, you know, necessity, urgency, that we as a college we as a university have to contribute to the national agenda, that we have to contribute to Oman's

Vision 2040, that entrepreneurship is something very important for Oman, and that educating the youth of Oman in a very high-quality standard could change the way that they really think, Khalil believed that such a strategy could put pressure on the management and the ministry to communicate more and pay more attention to entrepreneurship. (P19- Ibrahim)

As mentioned earlier, entrepreneurship is still relatively new, and many educators do not possess entrepreneurship-related qualifications. Offering training, and professional development courses can support educators in this regard. It was also revealed in the facilitating factor question how training supported educators in learning new ways to incorporate technology into teaching the subject. Laura, Nara and Khalil asserted that offering training on how to use digital tools in teaching and learning helps to teach entrepreneurship effectively. Nara, for instance, stated *“we got a complete detailed training on how to use the Canvas. They taught us how to use all the tools over there. We got complete training on these things. I was able to use it confidently after that training.”* Ruksat also added that training encourages educators to apply and adopt different methodologies in teaching entrepreneurship. However, it seems that many institutions do not offer enough training. Hanaa was clear that not many training sessions or workshops were provided to the educators in her institution. Abdul also justified the lack of training as a possible reason for some educators who use the traditional teaching style. This also corroborates with Haitham and Moud's experience that, because they almost had no training, they followed the traditional way of teaching entrepreneurship.

On the other hand, Raiden and others valued the training offered to them such as the Certified Entrepreneurship Educators programme, as it was an opportunity to learn and apply different strategies used in teaching entrepreneurship. Raiden also stated that the participants received materials that they could use in class, and they were introduced to different digital artifacts that many educators in Oman were not familiar with, such as simulation games. Bala expressed that a number of institutions may offer internal training to the educators, but it is a kind of routine training that is not tailored to entrepreneurship. Finally, Thelma shared the same notion, stating that the training she received was general training. However, she mentioned that her institute offered specialised training for certain subjects but not for entrepreneurship. She stated:

I would say the college doesn't always provide these types of training. And if they do provide, they're not specific to entrepreneurship. It's more general, and they would provide a lot of courses on subjects that are commonly needed, like accounting and finance, to introduce things for them. But for people who like entrepreneurship, because there are not a lot of learners who major in this, they wouldn't really provide it. (P24- Thelma)

Asif asserted that because of the training offered to him, he was able to use the Revenue Management simulation software used in his institution, and therefore, he concluded that the more training educators get, the better they can teach entrepreneurship. From his experience, he said:

I got good training on it (the software), and I loved the software itself, so it was easier for me to transform the information to learners and let them enjoy the software itself like they were operating a real hotel, basically. (P5- Asif)

A number of participants were not familiar with and had not heard about "serious games." Most of them have not had any training related to entrepreneurship, and therefore, this could also explain why they are not familiar with other digital artifacts that have recently been used worldwide. Haitham expressed that the management is responsible for providing training adequate for entrepreneurship.

Laura added that training is also crucial for the learners. Learners need to receive more training on how to use technology for their learning, particularly for those who are interested in creating their own businesses. Training for learners can help remove barriers, make them familiar with technology, and build confidence in using it. As Laura highlighted above, some learners may not be familiar with technology due to gaps in their school education. She emphasised that it is not just about offering training but ensuring its application, and this is where benefits become evident.

Finally, Majan revealed that her institution's affiliated body offered effective training and shared their experience in using digital tools in teaching. She emphasised that the training had a positive impact on her teaching. She narrated:

We have at the beginning of every year a group from (....) they come and because they have developed more technology, you know. So, they bring in their knowledge of expertise, they would inform us of the kind of teaching methods that they have developed during the previous year using technology, and they also share with us the software and platforms. Sometimes they also develop their own simulations that they would use in teaching. So we get this exchange of knowledge from them. And this way, we are trying as much as possible to always keep up with the current technology because our partner university in (.....) is a very big university and has a lot of investment. They invest a lot in technology, and they have developed their own software for games. So, according to one of the professors there, the course module itself for entrepreneurship is a simulation game. And they have to; they're given the game, and they have to manage the finances, the HR, everything. And then it basically calculates during these four or five months. While they were running this game, how much profit did their business actually make? And they would get grades based on how much profit they made. So it kind of mimics the running of an actual business. I think the business is a carwash shop. And you would have

to go in every day and manage everything, see the customers, and do all of this. And this is one method of how they use it. (P10 -Majan)

The financial and budgeting aspects have also been highlighted as major factors that impede technology adoption. Providing technology and some applications that require licensing means that institutions have to spend money. However, if they do not, then this can create issues. Ibrahim, and Ahmed considered financial limitations to be the greatest impediment to technology adoption. Arshad pinpointed that sometimes even the necessary equipment would be missing, and that the institution did not provide them, such as pen for smartboards. Therefore, he questioned if they would be willing to pay for something they consider as an extra, such as paying for certain software.

In addition, Salma stated that she requested some technology tools to be used in her teaching, yet the management refused to pay. Rushdi had the same experience. He elaborated that the management has an agenda on spending, and spending on technology tools does not seem to be a priority for them, and so *"even if you have requested it, you know, that will not be provided, because you have some past experience and you've been asking for some tools. Okay. And they will say things like, this is expensive, or because it's not been put on the agenda."* As Rushdi was a member of a number of committees in his institution, he understood their point of view in matters such as spending for digital tools, and so he further explained *"My experience is based on past experiences; I know it's not going to be provided. So, I know the limitations of the institution. I know, it's not that they don't provide this, but there are priorities. If you can facilitate the education without these extra things, then that's fine."* Unfortunately, such actions impact educators' roles, as some want to adopt up-to-date technology. This attitude can also hinder educators from taking initiatives. As Rushdi expressed, *"educators become less proactive in this; they wouldn't go to the next stage; why should they go and search for tools? Maybe they will search for free tools if that's okay and if I want to contribute, but those good ones you need to pay for, you know, it will not be an option."* Ibrahim and Ali, on the other hand, were of the opinion that educators in any case have to discuss, write and convey their requirements to the management.

Educators such as Ibrahim, Arshad, Abdul, and Rushdi who mentioned serious games affirmed that licensing is required and payment has to be made, and if institutions do not pay, educators cannot use them. Rushdi stated, *"I had the opportunity to attend a training in entrepreneurship education, and they introduced us to different kinds of digital resources, but it was difficult for us to use those because they are not provided in our institutions, because of financial limitations, they're not provided."* Bala also highlighted that due to a lack of funding,

educators are restricted to certain types of digital artifacts. Nevertheless, if the management spends more on technology, that will make entrepreneurship teaching more effective, as Bala stated: *"If institutions invest in more technology, very effective learning can happen. Learners will benefit more."*

Lack of budgeting has also impacted the provision of some of the necessary infrastructure. Educators emphasised that effective use of technology means that infrastructure has to be provided. Salma, for example, complained about the lack of infrastructure in her institution. She explained that even the internet connection and speed are weak, which can hinder using the basic digital tools. She did not find any support from the college management, as she asserted: *"The college doesn't encourage that much use of the technologies. There is no encouragement for us to use technologies.... The internet connection in the college hinders me using technology. Sometimes, when I want to start something, because of the bad network, I cannot continue with that.... We depend just on PowerPoint slides."* In the same vein, Zahi explained that lack of infrastructure is common in a number of other institutions, as he illustrated:

In many of the institutions, I know adequate resources are not available. You know all the resources you are talking about; they need institutional resource allocation. They have to pay for them. So for the entrepreneurship education purpose. I'm not sure about (.....), but five or six colleges where I have an opportunity to go many times, you know, in different community engagements, I don't see a difference between them and my college. Without allocation of funds from the teaching institution for such resources, then what are you talking about? (P3- Zahi)

Hassen even indicated that the management is not willing to spend even in updating their resources, such as the books being used for teaching entrepreneurship, and when he requested for the updated version, they refused to offer it! He narrated:

I remember, for example, that it was for a book; I actually require the book, which was the updated version. And I remember them saying that we cannot now buy it because it's expensive. So we waited, and we were waiting. I think until now, that institution still did not buy it." Hassen even found it difficult to install a program that learners wanted for their business idea: "And I remember one of the lab technicians at one of the colleges. I asked him to help me get my learners to use one of the programs because they had an idea for developing something and he was asking the IT department to install one of the program software in one of the labs, so he was struggling with the IT department because it was not available. And at that time, it was not licensed. And I don't know what happened after that, but this is one of the actual problems that we were facing. (P14- Hassen)

Haitham interestingly articulated: *"I look at technology as an investment that is made by the college or university management, and it depends on how much they are investing and how*

much they are committed. So I think it mainly depends on the management commitment, like how much they invest. Of course, it should go back to the, you know, strategies and the vision and mission of the institute and how important technology is to them." Laura summed it up by saying that without spending and providing an adequate budget for technology, effective teaching of entrepreneurship will not be properly achieved. Zahi confirmed that institutions have to dedicate certain budgets for technological upgrades and improvements.

A number of participants also expressed the idea that entrepreneurship-related clubs, incubators, and labs are beneficial to learners, yet currently, they are only available at some institutions. Asif stated that, although other clubs exist in the institution, there is no entrepreneurship club in his institution. Soraya shared the same notion, mentioning that it is a good idea to have a club, but it does not exist in her institution. It was only Zahi and Abdul who had a clear idea about the entrepreneurship club in their institution, and they seemed to be aware of its different activities. Furthermore, out of the 30 participants I interviewed, only six clearly stated that they have incubators in their institutions: Majan, Ruksat, Thelma, Mazin, Shamis and Haya. The lack of such facilities indicate that institutions do not invest in different resources, for example preparing and providing incubators, and as stated earlier, there is a general lack of spending for such purposes.

An interesting point that Ali mentioned is that some institutions are unwilling to spend money because they think that tools like serious games are only for fun, not for learning. They assume that such digital tools are unnecessary, so why should institutes spend money on them. Ali expressed: *"Many universities cannot prepare this type of license, or they are not eager to prepare this type of license. And also, when we talk about the game, usually the managers in the university think that the games or maybe use them just as a hobby and not as learning tools, for example."* Bala echoed Ali on this, and he said: *"And even in terms of, I mean, if you requested having simulation or serious games, what do you think the response would be from the management? Are they willing to spend money for this? Is there a budget? Absolutely, absolutely no."*

Another issue that was highlighted by a number of participants was that even where there are resources, some are not well-used, or there is no IT support to train faculty on how to use them. Rushdi questioned this matter: *"Sometimes resources are available, but are educators trained on them and how to use them with the learners?"* Zahi shared the same notion, and emphasised the idea that resources are not well-utilised at all. Salma explained that sometimes she faced technical issues, and the IT support was not adequate. She stated: *"The help desk technician that we have in my college is just aware of some particular and small*

technical problems; they don't know about the technologies in teaching and how to solve these issues, for example."

Finding a suitable digital artifact, mostly videos, that suits the Omani culture can be challenging, as reported by some participants, such as Abdul, Asif, Ibrahim, Ruksat, and Haya. Their idea is that most of the videos found on the internet are from the West, and some of them cannot be presented to the learners in Oman as they are not culturally suitable. Therefore, objects like dress code, language used, and issues like alcohol and smoking are not appropriate to be presented in the classroom. Haya, for instance, found this to be an impeding factor, as she narrated:

From a cultural point of view, sometimes like the video, this is actually what I have also been struggling with sometimes, that the idea of the video is very good, but for example, maybe the people, the way they dress, the way they speak, or the environment do not motivate to show it in the class. And so for this, you keep looking and looking for a material that suits the culture. (P6-Haya)

Asif also shared the same idea, confirming that it can be an issue. Therefore, educators need to be careful and ensure that the video is suitable not only from a content point of view but also from a design point of view. He also added that, as an educator, it is important to know how to cut and edit videos, as it helps in such circumstances. Finally, Raiden shared that in 2018, he invited a person to present at entrepreneurship event. The person is well-known, and he is a successful entrepreneur in the United States with thousands of followers on social media. However, this person used pictures and videos of alcohol in his presentation. Raiden said that he received feedback about that issue, commenting that this is understandable in a Muslim country.

Another challenge that was also raised by some participants is that most of the videos that discuss entrepreneurship-related topics are from the West, and there is a clear lack of local successful documented cases, which is important to relate learners to the environment that surrounds them. For example, Abdul explained, *"This is exactly what is difficult in our context in Oman, because if you will have to teach learners, you need to connect them to their context. For instance, in the context of Oman, we don't have that many videos that they are talking about successful stories of about some local entrepreneurs in Oman, so if you would like, for instance, to use any of those, you need to buy them from other contexts."* Haya also considered the scarcity of local cases presented in English as a main factor that hindered her from using technology in teaching entrepreneurship. Her point is that even if you find a local example, it is often in Arabic. She explained:

The second factor that hinders me to use different digital artifacts is that most of the materials are from countries like the UK, US, and South Korea. We don't have much material in English from Arabic countries; for example, if I want to search for local cases written in English, it is very rare or none. (P6- Haya)

Educators also noted that when they present digital artifact (videos) about international examples, learners cannot relate them to their local experience. Zahi revealed that *"When we are discussing with them something from, for example, Singapore, from the USA, or for example, Norway, or any of the countries, they take it like a story. OK. Or like a news. So when they find something locally or regionally successful in entrepreneurship, I observe that they are very keen to know, and they (learners) take it as a reality around them."* This indicates that learners need to be exposed to different digital artifacts with local content that they can relate to, as they feel that they do not have the facilities and resources that individuals in the West have. This was also confirmed by Harley, who asserted that when she presented examples of alumni business ideas and examples of local business, her learners interacted with them more than international ideas. She narrated:

I share our own alumni business and how it is helping them to grow as a businessman or a woman, as an entrepreneur rather than a job holder. So, I give the examples of our alumni and I also give, you know, the very famous examples. I gave an example of learners in Higher College of Technology (Oman) who started their business from the handouts, exam papers which were thrown in the corridors, and they started the paper recycling company, so I give you know, either these successful learners who entered into business from other colleges or from our own colleges because learners get motivated with something who they know. (P29- Harley)

In the same vein, Abdul also mentioned that even educators found it interesting when he provided them with a book that had examples of Omani case studies. He narrated:

You know SME Academy, they published one book about case studies in Oman, so believe me when I shared it with my colleagues here, who are teaching with me. So when I shared the textbook with them, you know, they were very happy because they knew that learners would like them. Local case studies we can explain to the learners about the context of Oman and we have in Oman many case studies. They are using the technology; look for example O-taxi, E Musharraf. Many of the businesses started using technology, and if you explain to the learners that this person started his business in technology or in something related to technology, they will be encouraged to know much about that. Yet many of these case studies are not documented, and this is an issue. (P2- Abdul)

Furthermore, educators confirmed that they use digital artifacts primarily from the West because they are abundant and accessible. These DAs are also useful to present to the

learners, as entrepreneurship is a global phenomenon, as noted by some participants. However, having local examples is crucial for the learners, which are still not common.

Finally, I asked the participants about the main factor that hinders the adoption of DA in EE, and their answers can be summarised as follows: When the management of the institute does not understand or is not aware of the importance of entrepreneurship to learners, they do not provide the required attention, support, and the financial requirements. This leads to issues impeding the use of up-to-date technology or the acquisition of licences for some software or programs. Moreover, it affects the provision of necessary infrastructure, a vital factor acknowledged by several participants hindering technology adoption. As a result, educators do not wish to spend time and energy searching for digital tools and requesting the management to provide these tools when they anticipate that the management will not fulfil these needs. Furthermore, even with the available resources, without proper training and monitoring, educators are reluctant to utilise them. Considering that many educators are not qualified to teach the subject, or that they are burdened with various responsibilities, becomes a significant factor in the underutilisation of DA in EE. The table below provides a compilation of quotes highlighting impeding factors in relation to the managements and resources.

Table 11: Absence of management support and resources sample excerpt

Absence of management support and resources
"Because we know that there is a financial limitation, educators become less proactive in this; they wouldn't go on stage, why should they go and search for tools?" Maybe it will search for free tools if that's okay and if you want to contribute, but those good ones that you need to pay for, you know, it will not be an option." (P11- Rushdi)
"I think these are the two things: that the instructor is aware of the different tools or the different digital artifacts that are available. And second thing also, the institution needs to provide. I mean, to provide these resources, and also the institutions, I believe, if they take a proactive role in this, okay, if they would go and approach instructors and say, Look, Salem, do you need any tools? We have the budget for you. Okay, do you need any tools to teach your course? That time, you'll be able to say yes, and you will go and search for any up-to-date stuff or something new. Okay. Then people will be aware, and we'll be able to utilise it. But I think both parties play a part in not making use of this." (P11- Rushdi)
"It is the management's responsibility to provide teachers with training about such tools. See, it should start with the management. I mean, management is the it's the, I believe that I can responsible number one is number one responsible for this one, because if we, if the

educators receive, receive clear instructions, so or at least, let's say, goals, targets, I think should come start with should start from, but it doesn't mean that the educator do not have some initiatives." (P17- Haitham)

"Infrastructure is lacking, and this is not a problem. This is not because the institutions do not have the resources or institutional understanding of entrepreneurship education; this is a question. Do they have the right understanding of the way to deliver entrepreneurship in education, different from the traditional one?" (P3- Zahi)

"I can share something with you; for example, here in (.....), we didn't really have an assigned person for the entrepreneurship and innovation department for almost two years. It was vacant, and I was there just internally to be in charge of certain things, you know, but no one was there. Just before almost 10 days, they assigned someone, as you know, the new head of the entrepreneurship and innovation department." (P13- Hamed)

"So lack of training could be one of the barriers for entrepreneurship, educators, and using those tools, basically." (P5- Asif)

"If you are not well developed with the new training or new workshops that are actually important to deliver and use such tools to deliver the course of entrepreneurship because there are many programmes now, you can enter this one thing that you mentioned, for example, the certified entrepreneurship programme, which is one of the programmes that actually help instructors develop such a course." (P14- Hassen)

"I hope that there will be some changes; there'll be more and more awareness, even training programmes, about the use of digital tools." (P13- Hamed)

"... staff need training on all these things, which will definitely encourage us to use them more frequently, which is more interesting for the learners and interesting for the staff to make teaching more like flip-flop learning or something like that." (P12- Ruksat)

"Some of the faculty don't have any training; they don't have the knowledge about what's appropriate for use as a method, a website, or a tutorial video." (P2- Abdul)

"Training is actually a routine. It is not tailored to entrepreneurship. It's that's a kind of an orientation that's given to all the faculty to use a generic platform. So for entrepreneurship, education, and the DA specifically, it's not the focus that's given by the institution." (P4- Bala)

"We need more professional development inputs. So more courses, more workshops on using those digital tools, that will at least open our minds, so teachers can know about them and use them. we need more real cases and successful stories to be promoted across."

(P16- Khalil)

"The college doesn't encourage that much use of the technologies. There is no encouragement for staff to use technologies because they may be expensive. I asked them for many things, and every time they said the budget." (P18- Salma)

"We would like to have things like simulation programs, but they are very expensive. We would like to use these simulations or any related software, but still, they are not available."

(P2- Abdul)

"The main obstacle to technology adoption, I will say, is the financial one..... So everybody knows that it's very important, but, you know, when it comes to financial things, maybe it depends on the decision makers—maybe on one person or two—and it depends on their willingness to invest. And that, I think, from my perspective, from my point of view, is the main obstacle." (P19- Ibrahim)

"If you don't have these resources or access to these resources, that is a key limitation that will hinder technology adoption." (P12- Rushdi)

"Actually, the institution infrastructure, this is one, and maybe the other if you are not well developed with the new training or new workshops, that are currently actually important to deliver and use such tools to deliver the course of entrepreneurship." (P14- Hassen)

"The main barrier to not using different types of digital artifacts is I would say the facilities provided on campus are not enough. (P21- Hana)

"Definitely, as an educator, when I'm going to give a video, I will definitely look into the cultural aspect; this is very, very important. So definitely, we are not going to give or talk about any video that is very sensitive. Sometimes what happens is that some videos talk about alcoholic drinks and all that, so those things we cannot encourage here for our learners, so definitely we filter a certain type of video, so we do customise those things to suit the culture and the needs of Omani learners." (P12- Ruksat)

"Today I was exploring, and I really liked the video; the video is very good. Then I found, you know, something that was inappropriate in the video, and then I decided not to use it, you know, cultural things." (P19- Ibrahim)

"most of the videos which we found from the Internet or from YouTube basically, those are international, like from different countries. And also, we have to study them first to see what kind of content might not suit the culture of Oman. So I have to search for another video. Maybe there is just a small thing in the video that might affect it, so I have to change the whole video. I have to find another video. Well, I have to study like how to edit and remove things from videos. You know, this is something we have to take care of, yeah." (P5- Asif)

To sum up, this section explored the second emergent theoretical dimension of DA adoption, concerning the various factors that hinder the adoption of different digital artifacts, as presented by the participants. The section began by highlighting the role of the learners as passive recipients of information, expecting to receive all instructional content from educators and demonstrating reluctance in utilising technology for learning. Subsequently, I moved to write about the role of educators as a hindrance to technology adoption. I presented issues such as educators' reliance on traditional teaching methods, their awareness of available digital tools, and their incompetency in teaching the subject as they lack the required qualifications. Lastly, I presented the role of management as a significant hindrance to technology adoption. I covered aspects such as management's awareness and understanding of entrepreneurship, their decisions related to allocating financial resources for necessary infrastructure, and the impact of a lack of training provision. The section also delved into the challenge of finding digital artifacts that align with Omani culture. The following section will elaborate on strategies used to overcome the impeding factors presented in this section.

4.4 Tackling the Obstacles

In the previous section, I identified the different factors that impede the adoption of digital artifact (DA). In this section I present the third emergent aggregate dimension, highlighting various strategies that participants have employed to overcome the hindrances indicated in the previous stage. In this section, I will illustrate different strategies employed to address the impeding factors. Tackling the Obstacles revolves around three second order themes which are: preparing the learner, optimising the educator, and role of the regulator. The subsequent section will elaborate each one in detail.

4.4.1 Preparing the learner

It was highlighted by participants such as Hamed, Mazin, Nara, Laura, and Khalil that learners were identified as one of the impeding factors to DA adoption. They characterised learners as passive, primarily listeners, and not actively engaged in the learning process. Furthermore, their awareness about the adoption of technology in learning was deemed to be below an acceptable level. Other participants, such as Hana, Zahi, and Ruksat, pointed out that learners tend to prioritise marks and grades over actual learning. Hamed, for instance, indicated that he attempted to implement different strategies to overcome learners' passiveness and quietness, aiming to create a more active and interesting class environment. He introduced practical and enjoyable activities to enhance learners' participation and engagement. Nara mentioned that not much progress had been made, as this issue is complex, and learners are expected to play their part in raising awareness about the potential use of digital tools. Nevertheless, she indicated some of the strategies she applied:

Well, we didn't do much to solve the problem, but of course, we try to refer learners to other types of technologies that they can use. In the classes, we are making them do presentations, and we are making them do video-like personifications things. We are always doing these things. So, if they wanted to do a video about the marketing mix or for their business plan, they used to do videos of like self-presentations. So, for all these purposes, of course, they are finding some new tools. Otherwise, they will ask us what we can do. How can I do the presentation? Can you just suggest? So, of course, we do suggest, we do refer them. (P30- Nara)

Other participants commented on the current situation and highlighted different strategies, where possible, to address learners' lack of awareness and understanding of entrepreneurship. Mazin elaborated that significant efforts are required in this regard. For instance, he emphasised the necessity of introducing entrepreneurship courses in secondary

schools, noting that some schools have already initiated the gradual incorporation of entrepreneurship topics. Additionally, he underscored the importance of awareness campaigns and mentioned that he presented a paper on this subject. However, Mazin clarified that addressing this issue at the university level poses challenges since the university's role is only a part of a broader ecosystem that requires comprehensive revision. He further explained that the country as a whole has begun taking additional steps to promote entrepreneurship, but still more efforts are required in this regard. He narrated:

We have not, I mean worked enough with the secondary school and primary school on the creativity of the learners, you know. We have accustomed learners to the conventional pedagogy, to the conventional knowledge, where the teacher has the knowledge, all the knowledge, and the learners will get this knowledge from teacher. They have not been accustomed to the research, and to focus on dependent learning, you know. I think this work that been missed out from the primary school. And Oman has started. You know, Oman has started, now there is a course entrepreneurship for secondary school. And I attended a forum; I have given a working paper for the Ministry of Education in which I shared our teaching experience in entrepreneurship programme. They have this course and they now they have started to train their instructors to the new pedagogical tools using during the entrepreneurship courses. So they started. (P26- Mazin)

Hassen expressed that he brought up the matter of learners' backgrounds with the head of the department, and the management is inclined to teach the subject when learners are in their third or fourth year, primarily not in their first year. By that time, learners are expected to have acquired essential skills that can benefit them in the entrepreneurship course, including proficiency in using technology and an understanding of higher education learning approach. Laura disclosed that she did not communicate the challenges she encountered while teaching the subject to the head of department, as she was busy with different responsibilities and a heavy teaching load.

Zahi indicated that not much has been done to address the issue of learners as an impeding factor. He underscored the role of management in altering learners' mentality, urging for a shift away from merely taking the module to pass and obtain grades. However, he also outlined a number of strategies he employs to uplift learners' mindset toward entrepreneurship. Zahi pointed out that he tried to introduce learners to different local successful case studies to inspire them to consider entrepreneurship as a viable option, rather than solely pursuing a government job, especially given the current challenging job market:

In our institution, we try to exemplify the learners with local case studies, and you know, and we introduce them with some of the success stories locally and especially from UAE, Qatar, Kuwait also. So we try to motivate them through the dimension of economic benefits that how they can become independent in career instead of waiting for opportunities of employment from the government or semi government organisation, and we try to educate them that if you look back 20 years back, everybody was getting employment from the government and now you will see that many of your friends and family members they are employed in the organisation and in future maybe the scenario will not be there. So look forward that what is happening around in the world that creating opportunities is better than to wait that others will create opportunities and you will go to fulfil the jobs as an employee. So, we have these tools only work. We have not done much. (P3- Zahi).

When I asked him again, 'Why?' He replied:

Our institution is satisfied, and the ministry is satisfied with the institution. The institution is satisfied with the practise. The point that is in my mind is that entrepreneurship must be realised as a drive from the top. Instructors cannot bring about a big change. If a big canvas is provided from the top, then instructors will be compelled to satisfy their role or to satisfy the expectation, and they will update themselves to be good performers and facilitators in that canvas. (P3- Zahi)

Here, Zahi clearly stated that unless the management takes different initiatives to promote entrepreneurship, not much can be done as an educator to enhance entrepreneurship, and therefore, not much is expected in terms of transforming learners' mentality towards entrepreneurship. In this context, Zahi aligns with Rushdi and Bala, emphasising that without clear directives from the top management or from the Ministry of Higher Education, substantial changes are not anticipated. In addition, Hana expressed that she tried to inspire her learners to generate innovative ideas, aiming to motivate them to embrace the idea and engage in working in it not for the sake of grades, but with the vision of seeing it materialised in the market one day. However, she noted that there have been no proactive measures from the management in this regard. Ruksat also highlighted that there have been limited efforts to change the current system from marks-based assessment. She explained that there is currently a review of the course structure, and she is hopeful that it will lead to positive changes.

Bala highlighted that learners' level is still not at the required standard for presenting innovative ideas. He emphasised that business ideas from learners must be new or unique. To assist learners in reaching that level, he pointed out that he implemented different activities and

games to inspire them, hoping that this approach would enable them to generate innovative business ideas. He explained:

There is a certain level of push that is required for the business idea that has to be unique, new, or innovative. So we have these kinds of games that we give them, like: if you are sitting on Mars, Mars Explorer, if you are the first person on Mars, then what is the product that you would want to sell? The Pathfinder Games—these kinds of games are there to open up their dimensions. There are many more games, but the simplest one that we use is the newspaper exercise, where they look at all the current affairs. Now, what we are using in the classroom is the Twitter handle, the hashtag. So which hashtag is trending? OK, so the trending hashtags and what is that you can do to solve that kind of thing. (P4- Bala).

To sum up, although a number of participants indicated that learners are one of the impeding factors to technology adoption, only a few have implemented strategies to address the issue. The table below displays participants' quotes highlighting this topic.

Table 12: Strategies to overcome learners as an impeding factor sample excerpt.

Strategies to overcome learners as an impeding factor
"Yes, learners care mostly about marks. But from my side, I encourage them to come up with innovative business ideas and feel that they really own the business and are ready to initiate it in the market. I give so much support, and I also challenge the learners to evaluate their feasibility studies." (P21- Hana)
"I did talk to the head of department and raised this issue with them, and for this reason, the college is revising everything related to the course, but to this point, they are planning to offer the course in the third year." (P14- Hassen)
"I look for new techniques to teach the course, and in this semester, I tried to have fun by the beginning of each class. I wanted them to come to the class with passion, so I tried to give them a challenge in every class. For example, I gave them a quiz and told them that if the answer is yes, they say no, and if the answer is yes, they have to say no. I also give them puzzles. I try to make the class funny and interesting so that I want to encourage them to talk. I encourage them to even make mistakes. I told them many times that there is no right or wrong answer; give your opinion. "So I try to build in them the idea of learning with fun." (P13- Hamed)

4.4.2 Optimising the educators

A number of participants, including Hamed, Laura, Ahmed, and Thelma, indicated that educators can be impediments to technology adoption due to various issues. These issues include teaching in a traditional manner, incompetence in teaching entrepreneurship, and a lack of awareness and understanding of entrepreneurship. While the majority of participants indicated that little has been done to overcome these obstacles, some of them shared different strategies. The following paragraphs will elaborate on this matter in detail.

Using traditional teaching methods was identified as an obstacle to DA adoption by participants such as Laura, Thelma, Hana, and Hamed. Despite their awareness that traditional teaching methods may not be very effective, participants acknowledged that they continue to employ them for various reasons. Thelma, for example, expressed a desire for more practical and less theoretical teaching materials but mentioned that the materials provided to her were of a traditional nature. When questioned about why she did not make changes, she responded, *"I haven't found the right tool that I am comfortable with, and I think that suits the course, so I'm hoping after there are more inductions and more training on these types of tools, I will consider making the change I want."* Hana also stated that she tried to equip herself with the knowledge required to use technology. On the other hand, she believed that teaching in a theoretical manner can be beneficial as learners learn about different theories and find ways to apply them. Hana explained her approach:

From my side, I try my best to equip myself with basic knowledge and teaching aids. Being "old school" is not a problem as long as you teach the learners all about entrepreneurship, "the theoretical part," and the practical part, for me, is running workshops for learners where they can apply whatever theoretically they have learned in reality. For example, Resource Based Theory and how an entrepreneur can overcome the risk of having no resources by coming up with a new source of resources. Learners can apply this in the workshop with a few tools, and if a tool is missing, what could be the substitute?! (P21- Hana).

Laura also faces challenges in changing the traditional way of teaching, primarily due to time constraint, syllabus requirements and nature, and learners' need for thorough explanation of each point. Laura confirmed that she used some videos in class, yet she emphasised that a significant portion of the content still heavily relies on theoretical explanation of various entrepreneurship-related aspects. She pointed out that approximately 80% of the teaching is theory-based. Laura also confirmed that because there is a final exam, learners are more inclined to focus on understanding the theory as it forms the basis for the exam. Despite raising the issue with the head of the department and proposing the removal of the theoretical exam,

she did not find any substantial changes. She expressed her desire to teach in a more practical manner, away from theoretical exams, yet the system does not allow that.

Arshad shared his astonishment upon discovering that the teaching materials provided for the subject were outdated and did not align with contemporary entrepreneurship trends. He commented that updating the materials and offering the basic requirements should be a priority, yet no one seems to care:

I got surprised when I saw the PowerPoint materials, they gave me. They were so old that some of the things have been since more than maybe 40 - 50 years back, and all the materials were almost not up to date at all. So I got shocked, and I got confused, I don't have time to prepare the material, because I already started the semester and they didn't give it to me in advance. Also, If the management does not offer some basic equipment, required by the educators, So how come for them to offer such technology for the learners? I don't think so. (P23-Arshad)

Khalil indicated that nothing has been done to find ways of changing the mindset. Even when such points are raised, they are typically dismissed with excuses of workload and a lack of time to explore solutions. Khalil further pointed out that educators, in general, view entrepreneurship as a generic course, and thus they feel that only basic knowledge is required to be covered. Ahmed pointed out that for changing the mentality of educators and reducing reliance on theocratical teaching, educators need to be part of a community of other entrepreneurship educators; alongside this, educators should also be provided with ready-made materials of possible DA to facilitate their teaching. Ahmed suggested that this approach could be incorporated into the educator's annual review, as is implemented at his institution:

Offering some kind of communities of entrepreneurship educators, or they can find some kind of sources that can be used in teaching, ready ones that educators don't have to create, that can help to encourage them to use digital tools. What we did is that we introduce workshops for teaching them how to use these resources. And after that when we have a meeting for course review, we asked teachers if they were using the software or not using it and how they use it what was the problem. To Some of them, we asked them to provide some kind of material or exam samples of learners who worked and so on. Therefore, we encouraged educators to use them. (P25- Ahmed)

In addressing the lack of basic knowledge about entrepreneurship, Hassen found courses like the Certified Entrepreneurship Educator to be valuable for raising educators' awareness and enhancing their knowledge to effectively teach the subject. He also noted that the course presenters were all qualified in the field:

So, there are many ways to actually overcome the challenges, and maybe one of the courses is the certified entrepreneurship educator; it may help the instructors actually learn new ways of delivering such courses. And because, you know, they are on that programme of bringing sometimes many experts from outside Oman, and I remember one of the experts from Finland, which is considered to be one of the top countries applying good education systems in the whole world. (P13-Hamed)

While some educators noted that some software and applications require paid licences. Majan Ali, and Hassen's strategy is that they go for free resources, which do not require more than registering an account. Ali directed his learners to try and use the free business games that are available online: *"Actually, games usually introduce problems to the learners regarding business and how they can solve the problem. They are also free games in the app store. Learners can find them just by searching for business games."* According to Majan, being aware of the different free platforms help educators use them in teaching. She stated:

You have to be aware as an educator of what is already available, freely available. I would always go for the freely available ones. There are a lot of things that are online that platforms can offer, like free access, or at least a free trial. I think most of the things are available freely online, especially after COVID. There is free software that we can use in teaching; they taught us how we can use Kahoot, like this audience engaging these platforms. (P10-Majan)

Use of alternative strategies were mentioned by some of the educators in case of an issue with the internet connection. Salama, for instance, pointed out that to overcome the problem with the network issues, she would download all the materials required beforehand, so that even if there were internet connection issues, she would have a backup copy of the materials. Laura stated that she kept some hard copies of exercises that could be completed in class. The former said:

I try not to depend on the internet all the time; we have to download, for example, these programs or templates to be saved on my desktop, and we can access them anytime without using the internet. (P18- Salma)

To convince the management to offer simulations, and serious games, Ali stated that educators need to explain their benefits and advantages to convince the management to invest in such digital artifacts:

And another obstacle is to make the management familiar with the different tools, IT tools, and the advantage of these tools, for example, the games, the business games, so the educator can help the universities overcome this obstacle by introducing these types of facilities to the management and

talking about their advantage and how these facilities can help to improve learners' knowledge in entrepreneurship. (P15- Ali)

Furthermore, both Abdul and Mehdi appeared to concur that offering specialised training with a focus on practical learning could be the best approach to address the challenge of educator competency. Hamed and Haitham had expressed earlier that in their institutes, there was no one with the right qualifications to teach entrepreneurship. Both indicated that nothing has been done to tackle this issue. Hamed continued to say:

I don't think the management will attract those who are specialised in entrepreneurship. Interestingly, there was an advertisement about the vacant post in the institute, yet nothing about entrepreneurship. What to say? I really feel that something should be done, but nothing has happened so far. Here, no one is special. Only me and another teacher attended the Certified Entrepreneurship Educator course, but other teachers are not specialists and have not attended any course related to entrepreneurship at all. (P13- Hamed)

Raiden stated that that his institute has recognised this issue and is aware of it. He is hopeful that the situation will change, but he confessed that *"there is a change, yet it is still slow and small."* Mazin also acknowledged that not much has been done to address this issue. However, he indicated that the university is eager to establish an entrepreneurship centre and incubator. In this regard, he expects that the management would seek competent educators to teach the subject and to manage the centre. The table below contains a list of quotes that highlight the strategies used to overcome educators as an impeding factor to the adoption of DA.

Table 13: Strategies to overcome educators as an impeding factor sample excerpt.

Strategies to overcome educators as an impeding factor
"Yeah, it is more theoretical because of our time limit, there's a time limit to every class.," Secondly, our learners want a lot of theory to understand certain things. We can only incorporate digital tools when a student comes to class with some knowledge tor some kind of preparation and then we can take them to different platforms. But here, what happens? The class becomes theoretical, and we're not able to use it, and we also do not have any digital platforms to use Sometimes our Internet services, and all don't support that." (P1- Laura) "We don't get time to do more practical things because the jargon is so much. For them to understand and then formulate a plan, a business plan, based on what is being taught, and

then, you know, we have the final exams, 100-mark final exams, to get them ready through all those slides. I would love to do that. I would love to one day tell them, OK, let us meet in Carrefour or somewhere in Lulu (the supermarket) and then do the lesson from there. OK. I would love to do that, but the problem is that we have a class test to adhere to and we have a final exam to adhere to 100 marks, which is holding a 50% percentage." (P1- Laura)

"If these educators or these teachers are not equipped with the right tools up to date, they will be so far from the recent vibes resent what a squat technology is because enterprises nowadays are using technology a lot, especially for the marketing strategy, for the virtual even types of enterprises that don't even have a space in reality. So things are changing dramatically, and if they are not equipped with the lectures with the recent vibes and the latest technologies used on this subject, they will be far from reality, and the new generation is very well equipped with technology. So, these are some of the limitations that are basic. So, how come we expect to get more than this? And you are not just going through the basics." (P32- Arshad)

"Changing the mindset takes a long time, and whenever we raise this point among other educators and management, immediately we get a response, that they are busy with other commitments, especially, currently they are required to do lots of research, and there are also lots of administrative work. They don't have time for another task, that they may not see important, which is trying to change learners', and educators' mindset. They just want to finish the basic requirement's in delivering this course, using the traditional way of teaching." (P16- Khalil)

"The available resources that can be used for free on the internet So, for example, Business Model Canvas is free, and you can, for example, use Google Share documents in order to let all the groups of learners work together online and develop something that, in the end, will be valuable for them. Many tools are free, and they just require you to register an account. That's easy." (P14- Hassen)

"Actually, games usually introduce problems to the learners regarding business and how they can solve the problem. They are also free games in the app store. Learners can find them just by searching for business games." (P15- Ali)

“To tackle this issue, we conduct training, seminars and workshops to improve the competency and the capabilities of the educators. We also send some faculties abroad to build their capabilities.” (P1- Abdul)

“To my best of knowledge, in my institute, no one is competent in teaching entrepreneurship. The reason is not clear to me. The management has not taken any action to rectify this issue.” (P17- Haitham)

“Faculty members teaching this course are trained on certain skills and also sent to attend full proper training programmes to upskill the competency and skills required to deliver this course.” (P27- Mehdi)

This section covered the strategies used to overcome educators as an impeding factor. As presented by the participants, the documented strategies are very limited, and in most cases, there are no clear strategies to tackle the impeding factors. The following section will address the topic of strategies to overcome management as an impeding factor.

4.4.3 Role of the Regulator

It was highlighted earlier that the management of different academic institutions was one of the impeding factors. This is due to their lack of understanding of entrepreneurship and its requirements, their lack of support, and their inability to offer adequate training. The following paragraphs will discuss each issue in detail and present the participants’ responses regarding different strategies to overcome the impeding factor related to management.

It was also highlighted by a number of participants such as Zahi, Hamed, Thelma, and Salma that the management support in technology adoption is not to a satisfactory level. Zahi noted the positive impact of using technology in teaching, yet the management does not seem to recognise that. He articulated: *“It is very important to let learners experience these tools and facilities because these tools and facilities themselves have the power to motivate the student. So, this philosophy, this institutional philosophy is lacking.”* Hamed, for instance, believed that if the managements do not support it, then technology adoption will not be embraced in institutions. Hamed said:

I think there should be support from the top management, if there is really good support from the management or higher education institutions about this, believe me, that that will really make a difference, you know because sometimes things will really go smoothly if there is support. But if there is no

support, or if they do not really care about this, nothing will happen. No change will happen. That'll actually, you know, why should I try to learn new techniques or to do new things to apply entrepreneurship? If there is no one caring about it, it doesn't matter. Maybe for the top management, whether you want to improve it or not? It doesn't matter, you know, so I see it, I feel Yeah, and if there is support, if there is more focus on this, from the top management that might also help. (P13- Hamed).

This also corroborate with other participants' idea, like Rushdi, and Ibrahim, that it all comes from the management. If they support and provide the required environment, then entrepreneurship can flourish. Nevertheless, Rushdi highlighted that the management would not support or change its strategy towards entrepreneurship unless there were directives from the Ministry of Higher Education. According to him, otherwise nothing would change. Ibrahim mentioned that they have requested certain aspects, such as improving the syllabus, incorporating more practical aspects into the course, providing more resources, and offering training. Currently, a follow-up is going on with the management in this regard.

Zahi also clearly pointed out that unless the Ministry of Higher Education instructs the institution to provide a certain type of technology, they will not do so. He stated, "*The private colleges are closely monitored and regulated in this way. So if they will receive instruction or a policy from the top that our learners must be provided with the latest tools.*" Zahi continued to say that teaching entrepreneurship in a traditional manner will not achieve the goal of producing more entrepreneurs: "*They are considering it just a course to familiarise learners with entrepreneurship, not with the objective that we must try to engage learners in this. It's a good understanding, but this will not make the change. Change will come when we, as an institution, realise that we must try all means to engage learners in this.*" Zahi reported that he did not take any further actions to address the issue with the management as they are satisfied with the way the course is being conducted. He also mentioned that he brought the matter to the attention of the management, and a meeting was held to discuss it; however, no significant progress has yet been made: "*There have been some meetings lately between academic staff as a discussion forum, but any meaningful or significant proposal or strategy change is not evident.*"

Hana indicated that she raised the issue of entrepreneurship and the support required to make it an effective course by providing a list of suggestions, yet she stated that nothing has changed, and her suggestions were not taken to improve the course. She stated, "*I suggested and had to do the suggestions on my own. I talked many times to different authorities on our campus, but nothing has been done.*" Moreover, Hassen raised the issue of the high number of learners in each class, which hindered educators from providing effective support for

learners' ideas. Hassen pinpointed that he raised this issue with the head of the department, and the management agreed to decrease the number. Hassen also noted that the management offered more classes and sections to decrease the number of learners in each class.

Regarding training, Rushdi explained that he did write detailed feedback twice about what is required to change, such as more training and digital tools to be used in teaching, yet he said that nothing was changed. Rushdi said, *"We've raised some of these issues. In terms of the attempts, I don't see many attempts to improve. So basically, there's no intervention happening."* Hanaa affirmed that she did approach the head of the department for training, but nothing was offered due to the lack of funding. That was the response she received. Laura also stated that training is important, but she did not request it. When I asked 'Why?' She did not respond, as she was not sure what to say. She stated that she got busy with other responsibilities: *"I was busy because till last semester we were teaching 21 to 22 hours."*

Zahi highlighted that specialised training would help educators perform better, yet nothing has been done regarding it: *"For educators who teach entrepreneurship, if they are provided with certain trainings for teaching this course differently from conventional teaching in academic courses, they will be better performers in the class, and they can facilitate their learners' engagement so they can improve."* While Hassen stated that the management signed a memorandum of agreement with one of the bodies to offer "train the trainer" programme to the educators. Thelma also stated that after requesting for more training to use different technological tools, she only received a request form to fill out and state the required training courses.

Hana did raise the issue of workload with the head of the department, but the issue still remains the same as no new staff was recruited nor was any other measure taken for resolving the issue. Thelma and Khalil shared the same notion that nothing was done to tackle this issue of high workload. Laura mentioned that the management decided to reduce the workload: *"It is only from this semester onwards that we are only restricted to 16 hours, 16 to 18 hours. Yes, the workload is always there. There's also so much admin work to be done. I've been working in academic advising on the ERP system because everything has to go through the ERP system, you know, so there is a lot of admin work in that matter."* Shamis also highlighted that workload is one of the challenges, and he stated that his institution is in the process of reducing the workload, as currently, the educators teach for 20 hours, plus the other administrative responsibilities. When I asked him why was the workload a challenge, and whether it was due to lack of educators or a financial issue? His reply was: *"It is difficult to say*

here. I can't say that now, but I think you mentioned some of them, but we are working to reduce the load." I asked Shamis this question because, beside teaching entrepreneurship, he is also a member of the management in his institution, but he was cautious in elaborating on this matter. Hamed, who also raised the issue of high workload, pointed out that he cannot address this matter directly with the management due to a policy that is applied to all in the institute. He mentioned that he can present the issue indirectly to the head of the department by stating that, aside from teaching, he has other responsibilities, such as overseeing certain committees.

Ahmed revealed that offering some good digital artifacts requires an allocated budget. He revealed that for a few years, the software was financially supported, but this support did not last long. He was informed that management has its own priorities, and therefore, no more money will be spent on such digital tools. He was instructed to look for freely accessible alternatives because there was no budget allocated for these tools later on. Ahmed narrated: *"For almost two years, we started to receive funding and resources for software and so on, but later funding was discontinued. They were not willing to pay because they said, maybe you can find free alternatives. This kind of challenge is to find the open sources, for example, YouTube, Google Search, and other material, to find some kind of material, or sometimes to create material myself by collecting different things and use the local business environment as a source sometimes."* As Rushdi stated earlier, the management does not perceive this as a priority, so they can easily hold this type of expenditure. He also stated that the management would ask educators to look for free materials: *"My experience is based on past experiences, and I know it's not going to be provided. So, I know the limitations of the institution. Okay, I know, it's not that they don't provide this, but there are priorities."*

Abdul affirmed that he did convey the requirement for a full-fledged entrepreneurship lab to the top management, yet nothing positive has transpired so far. He is aware that this would require a budget, and the top management may not be willing to allocate significant funds for such projects:

As you know, these require a budget, yet as in many universities, such items are not high on the priority list, although in my university they encourage the use of such technologies in teaching methods. This will take time, and we don't know when these tools will be provided or approved by the top management. We try our best to follow up with the management, but may be because of the limited financial resources, they may not pay for these programs. Also, we are trying to communicate with some companies in Oman to fund the purchase of simulations and programs and get access to the licence, but to be frank, we have not found any company to fund us. Also, we have not gotten any replays from the management yet. We try to

use whatever is free. With this current generation, they are looking for this technology, and they are very interested in using it. (P2- Abdul)

Regarding the videos that do not suit Omani culture, Abdul raised this issue with the management of his institution. His idea is to create a local curriculum for the entrepreneurship course, even a basic one to start with, and videos can be part of the curriculum. He also stated that in his institution, they are discussing the possibility of producing videos of local start-up examples. However, according to Abdul, this is a huge project that requires involvement of different bodies, and no one has taken the initiative yet. He highlighted that there is also a lack of written local case studies about successful entrepreneurs:

We have good communication with all the institutions in Oman, and there is a gap in utilising this. There is no action plan for creating local case studies and no initiatives taken by any organisation, even the ministry itself; there must be a plan from the ministry, yet nothing in reality. (P2- Abdul)

The following table exhibits the participants quotes highlighting the strategies to overcome management as an impeding factor to DA adoption.

Table 14: Strategies to overcome management as an impeding factor sample excerpt.

Strategies to overcome management as an impeding factor
"We know there is a coordinator for the course, and you will be sending maybe some instructors' feedback. But for me I gave up. I sent it once, twice. I felt that the next time, the third time, no one was listening, I gave up." (P11- Rushdi)
"I feel that when there are government directives, when there is government monitoring of a college or university, then they take it very seriously." (P19- Ibrahim)
"So only recently we received from the Department of Training that we needed to fill out a survey, and in that survey, they asked us, what type of conferences or trainings would you like to attend? For me, I did click on the training option. And I also mentioned that I would like to expand my use of technology. I'm, I would say, moderately okay with technology. Yes, I'm not familiar with all the technologies, and they think that's what kind of sets me back. But as I practise, I'll be fine with it. So I didn't mention to them that I was more trained on these things." (P24-Thlema)
"This is one of the main challenges we have here because, as you know, the workload or the teaching load is really too high. Yeah, it's a lot. This is one of the main challenges, and

now we are in the process of doing some reduction in workload, but not a big difference."
(P28- Shamis)

"I cannot present the issue of workload to the management because of the policy we have now, but it depends. Sometimes you can have less teaching load, but I have some other commitments, like now I am organising a symposium, I am also in charge of the community engagement committee, I am also in charge of the media committee, and of course I have academic advising plus other responsibilities. I cannot raise this issue, but I can talk about it indirectly." (P13- Hamed)

"We have discussed the issue of workload with the management. While teaching is the core business, research has also become important, as institutes now focus on raising their ranking systems to the international ones. As these ranking focuses more on research and publications. So now we must do both, teaching and research, and so, workload is still an issue, and nothing has been done to tackle this issue." (P16- Khalil)

This section, in three parts, addressed the third aggregate dimension, focusing on the strategies employed by entrepreneurship educators to overcome the impeding factors outlined in the previous aggregate dimension. Initially, I discussed strategies to overcome learners as an impeding factor. While most of the participants did not explicitly mention clear strategies for addressing this issue, a few indicated that they had raised the issue with management. Some attempted specific strategies, such as raising learners' awareness of the importance of entrepreneurship, exploring different methods for more interactive classroom environment, and showcasing successful local businesses.

Secondly, I explored strategies related to educators as an impediment. There hasn't been substantial change in moving away from traditional teaching methods. However, educators expressed a desire for more practical and less theoretical lessons. Participants also mentioned opting for free software instead of paid ones.

The final part discussed strategies to overcome the impeding factor from the management's side, as they do not seem to be fully aware of the potential of entrepreneurship and, consequently, fail to provide adequate support. Most participants faced challenges in overcoming this issue, as managements appear content with the current situation without assessing the effectiveness of the course. Participants indicated that significant changes would likely occur only when managements receive directives from the Ministry of Higher

Education. Additionally, limited financial support and insufficient training were hindrances to enhance entrepreneurship, while managements had other priorities.

In conclusion, it appears that there are no clearly defined strategies implemented by educators to overcome the impeding factors. Throughout the data collection process, when participants were questioned about strategies, their responses often comprised lists of recommendations regarding what needs to be done, rather than specific strategies for overcoming the identified obstacles. The following section will discuss the proposed model of the process of DA adoption in EE that captures the connections between the concepts discussed so far in this chapter.

4.5 Developing a process model of digital artifact adoption

In the previous sections, I addressed three aggregate dimensions derived from the in-depth analysis of the interviews, presenting the three stages, which are: 'Building the Foundation', 'Diagnosing the Obstacles', and 'Tackling the Obstacles', respectively. Consequently, I reported the facilitating factors, impeding factors of technology adoption, and strategies to overcome the impeding factors captured by the respondents. To create a process model explaining how digital artifacts adoption unfold, I organise the main concepts and themes as outlined in Table 15 below. The columns are arranged to describe the facilitating factors, impeding factors, and strategies to overcome the impeding factors, respectively. These are termed as 'Building the Foundation', 'Diagnosing the Obstacles,' and 'Tackling the Obstacles,' respectively. In each column, under each concept, the main themes are illustrated, displaying the three primary players in technology adoption: learners, educators, and management. When reading the table in rows, it becomes apparent that each row focuses on one main player. For example, the first row concentrates on the learners, highlighting their role as a facilitating factor, their role as an impeding factor, and what is required to become a supporter of DA adoption.

To summarise the overall findings:

1) The role of the current generation of learners and currently available technology is crucial for achieving the ultimate goal of technology adoption. The availability of different DA that educators utilise in their entrepreneurship education classes facilitate technology adoption. Plus, the role of the learners, their willingness to learn through different DA support the adoption of technology.

2) Educators play a vital, if not the most critical role in technology adoption. Their competency, efforts and initiatives are instrumental in driving DA adoption, but they can also be an impeding factor. Therefore, optimising their role is essential.

3) Management, as another crucial stakeholder, plays a significant role in providing the necessary support and facilities successful technology adoption. Their contribution cannot be overlooked in achieving the desired outcomes.

In this section, I will address the primary research question: "How does the process of digital artifact adoption unfold by entrepreneurship educators?" Drawing upon the overall findings, three overarching dimensions emerged (as depicted in the data structure, Chapter 3), which ideally represent three technology adoption stages, outlining the unfolding process of entrepreneurship educators' adoption of digital artifacts. Beginning with identifying existing

factors that facilitate adoption, the factors that impede adoption, and the strategies to overcome the impeding factors and to ensure smooth technology adoption process. While acknowledging that the process model in this study encompasses three stages, it is essential to recognise that this is an oversimplification of the phenomena under investigation. In reality, the chronological sequence presented here may not be as linear as the boundaries of the three stages can overlap and become blurred. The first stage encompasses the factors that can lead to DA adoption.

The second stage highlights the factors that impede DA adoption, and third stage discusses the strategies required to overcome the impeding factors in order to lead to DA adoption, and therefore the second and third stages overlap. Nevertheless, the model generated in this study provides a simplified representation of technology adoption by entrepreneurship educators within a specific context.

As summarised in Table 15 below, the first stage in technology adoption is 'Building the Foundation.' This stage reflects the positive current situation where learners of the current generation, educators, and management with the provided infrastructure create an appropriate environment for the ultimate goal, which is DA adoption. If this scenario is present in higher education institutions, technology adoption will be implemented effectively. The successful digital artifact adoption process is attributed to the following factors: The learners are responsive, willing to learn and engage with learning when using DA; the availability of various types of digital artifacts for teaching entrepreneurship: educators are qualified, passionate about the subject, and work as a team to provide the learners with effective learning experience; and supportive management that provides the required infrastructure for adopting DA in teaching practices.

The second scenario, 'Diagnosing the Obstacles' represents the impeding factors, namely the learners, educators, and management, all of whom act as hindrances to technology adoption in various ways. The learners are not responsive, and do not engage while using DA in the learning process. The educators are overloaded, lacking the required qualifications and training. The management does not seem to be aware of the importance of entrepreneurship, leading to non-provision of the required infrastructure, training and funds. This scenario does not lead to the ultimate goal, which is the adoption of DA in EE.

The third stage, 'Tackling the Obstacles' intends to capture the strategies applied to address the different impediments identified in 'Diagnosing the Obstacles.' From this study, the currently employed strategies appear to be ineffective, though they present what educators did and are currently doing to overcome the impediments they face. The following paragraphs discuss the process model in detail.

Table 15: Summary of technology adoption process

1. Building the Foundation	2. Diagnosing the Obstacles	3. Tackling the Obstacles
<u>Current generation & digital learning</u> - Current Available DAS - Current generation & technology	<u>Recipient as a hindrance of technology adoption</u> - Lack of learners' awareness of importance of Entp - Learners think about grades and marks	<u>Preparing the learners</u> - More practical & fun activities - Encourage learners to bring innovative ideas - Discuss the issue & find solutions
Educators as a vital factor - Educator's awareness of importance of technology - Educators' initiatives for effective teaching of E. - Educators work as a team - Educator's willingness, passion and motivation	Educators Inefficiency - Educators teaching style & awareness using DAS - Educators' competency in teaching the subject - Educator's workload	Optimising the educators - Identify certain digital artifacts - Attend workshops & take trainings - Look for free online materials
External success factors - Availability of proper facilities & Technical support - Availability of entrepreneurial culture	Absence of Management support & Resources - Management's awareness & understanding of EE & lack of Entrepreneurial culture - lack of training - Need for budget to offer the proper infrastructure - Finding suitable DAS	Role of the Regulator - Support & promote entrepreneurship - Provide training - Allocate budget for digital tools

4.5.1 First stage: Building the Foundation

The process of technology adoption commences with identifying ‘the foundation,’ highlighting the current factors to facilitate the adoption of digital artifacts. The data revealed that when the three main players of technology adoption are in an optimal situation, this will ultimately lead to technology adoption.

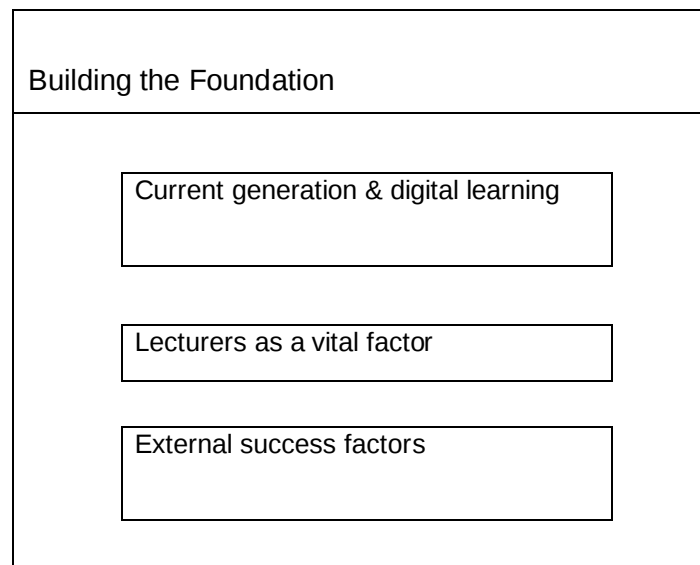
First, learners of the current generation are responsive, willing to learn, and capable of learning through the use of technology, supporting technology adoption. Furthermore, there are many types of available digital artifacts to choose from. Participants reported using tools such as business model canvas, pictures, videos, Moodle, Blackboard, and online courses as some of the DAs employed in teaching entrepreneurship, and therefore, this enhances technology adoption.

Educators also play a vital role. They have identified certain DAs to be adopted. Educators are also aware of the importance of using technology and practical teaching of entrepreneurship; therefore, they have taken various initiatives to benefit the learners. For example, some participated in online and in-person training and workshops to acquire new skills and learn about new technologies to be applied in teaching and learning. They are also passionate, motivated, and willing to learn about and teach entrepreneurship. Working in teams, they can share ideas, discuss different issues, and explore better teaching practices. These educators are competent in teaching the subject because they possess qualifications related to entrepreneurship. The situation further contributes to technology adoption.

Another reason for technology adoption is what I termed in the second order theme as ‘external success factor,’ which encompasses managements and the infrastructure. The role of the managements lies in their understanding of entrepreneurship, and their support in promoting it. For example, when an educator proposed an entrepreneurship exhibition, the management provided the necessary support and resources to make it a successful event. Additionally, the intention of some higher education institutes to establish pathways in entrepreneurship reflects an understanding of this topic and anticipated future demand to establish it as a full programme. Their support extends to offering training and the necessary resources. Moreover, the provision of incubators, labs, and centres demonstrates that managements are keen on funding initiatives to encourage learners and provide them with a safe environment to initiate their businesses. They are also ready to support in offering trainings and provide the required resources.

To summarise, the availability of the three stakeholders support is required for this technology adoption process. The table below summarises this stage.

Table 16: Building the Foundation



4.5.2 Second stage: Diagnosing the Obstacles

The second stage of the technology adoption process is 'Diagnosing the Obstacles'. At this stage, the respondents highlighted the different factors that impede DA adoption. In this stage, three main themes emerged as impeding factors, which I termed as 'Diagnosing the Obstacles.' Here, the respondents explained what they encountered as a hindrance to technology adoption in teaching entrepreneurship. This stage overlaps with the first stage and confirms the process of DA adoption. The impeding factors in this stage were mainly what was considered to be facilitating factors in the previous stage.

The first impeding factor is the learners, including their perspective and understanding of entrepreneurship. As mentioned earlier, entrepreneurship is offered as a compulsory module, and learners take this module typically to specialise in different majors. Consequently, a significant issue arises because many perceive this module as a requirement to pass rather than one that could shape their future career. Consequently, learners' perspectives on entrepreneurship are often absent. Furthermore, learners express a desire for entrepreneurship to be taught in a traditional manner, similar to other modules where they attend class, listen to the teacher, take notes, memorise, and take a final exam. One participant indicated that even the good learners hold this mentality. Learners do not seem to recognise the purpose of studying entrepreneurship; therefore, they act as an impediment to DA adoption. On the other hand, learners in the previous stage were opposite

Entrepreneurship educators pose the second hindrance to technology adoption. First, as reported by participants, entrepreneurship is taught in a traditional manner, teacher-centred style, and the chance for practical application is marginalised. Some participants indicated that approximately 70% of their teachings were theoretical. One participant admitted to adopting a more traditional and less creative teaching style, attributed partly to the absence of training and workshops acquainting educators with various applications and software for teaching. Another concern is that a number of educators teaching entrepreneurship lack the necessary qualifications for the subject. Some of them have not even had a training at the least. One participant reported cases where educators were assigned to teach entrepreneurship against their will. They are assigned to teach entrepreneurship against their choice and are also not given appropriate training for teaching it. Two participants highlighted that not even a single educator has a qualification related to entrepreneurship, despite thousands of learners being taught this subject. Additionally, educators face overwhelming teaching and administrative responsibilities, hindering them from exploring new techniques for teaching entrepreneurship. Therefore, the current situation of these educators constitutes another major impediment to technology adoption. This confirms that educators are central to DA adoption, but their resistance can be a significant obstacle.

The third reason hindering technology adoption is the absence of management support and lack of resources. The management of some academic institutions hinders technology adoption in various dimensions. Some participants criticised the management, noting that it does not seem to understand the potential benefits of entrepreneurship for the learners and the country as a whole. For example, the management is indifferent to the manner in which entrepreneurship is delivered, as long as learners pass the module. Also, the management does not support embracing the technological tools that educators deemed vital for teaching, such as not covering the costs of licenses for serious games. In addition, due to educators' experience, some are hesitant to request for offering digital tools because they anticipate a negative response from the management. Therefore, if the management does not provide the required infrastructure, then DA adoption will not happen.

The educators also explained how training and the availability of technical support positively supported them in adopting DAs in teaching practices. On the other hand, the lack of a financial budget also has impacted the provision of necessary resources, including what is now considered a necessity everywhere, namely, Internet connection. Additionally, the management does not appear to promote entrepreneurship clubs or initiate incubators. In general, these managements seem satisfied as long as learners pass the course, without investigating the course's effectiveness for the learners. This is especially perplexing when considering the global attention on topics like empowering small and medium enterprises,

entrepreneurship, and, locally, the Oman Vision 2040, as well as the establishment of various governmental and private bodies for these purposes.

In summary, with the presence of the three pillars of hindrances -learners, educators, and management- all contribute as impediments to technology adoption. This implies that technology adoption will not be properly implemented in the wake of these impediments. The table below summarises these hindrances.

Table 17: Diagnosing the Obstacles

Diagnosing the Obstacles
Recipient as a hindrance of technology adoption Lecturer Inefficiency Absence of Management support & Resources

4.5.3 Third stage: Tackling the Obstacles

The third and final stage for technology adoption is 'Tackling the Obstacles.' This stage is closely related to the previous stage and as per this study and the context discussed is compulsory to the process of technology adoption. The preceding stage identified various obstacles, and this stage explores potential strategies to overcome them and achieve the ultimate goal, which is technology adoption.

Firstly, the strategy of 'Preparing the learners' serves as a solution for the first hindrance names 'Recipient as a hindrance.' It is crucial to initially acknowledge the existence of issues and the necessity to address them. Methods and solutions need to be explored to overcome challenges and problems related to learners. For example, addressing issues such as a lack of awareness of the importance of technology can be tackled through awareness campaigns, establishing incubators and entrepreneurship labs, and organising competitions to raise

awareness and provide practical entrepreneurship experiences for learners. Nevertheless, as reported by the participants, little has been done to address this issue.

Secondly, 'optimising the educators' as a recommended strategy to the obstacles related to 'Educator Inefficiency.' The latter represents the theme of educators acting as obstacles to DA adoption due to personal characteristics or work-related issues. Therefore, some of the strategies to enhance educators' skills include activities such as attending workshops and trainings and seeking free online materials, as indicated by the participants.

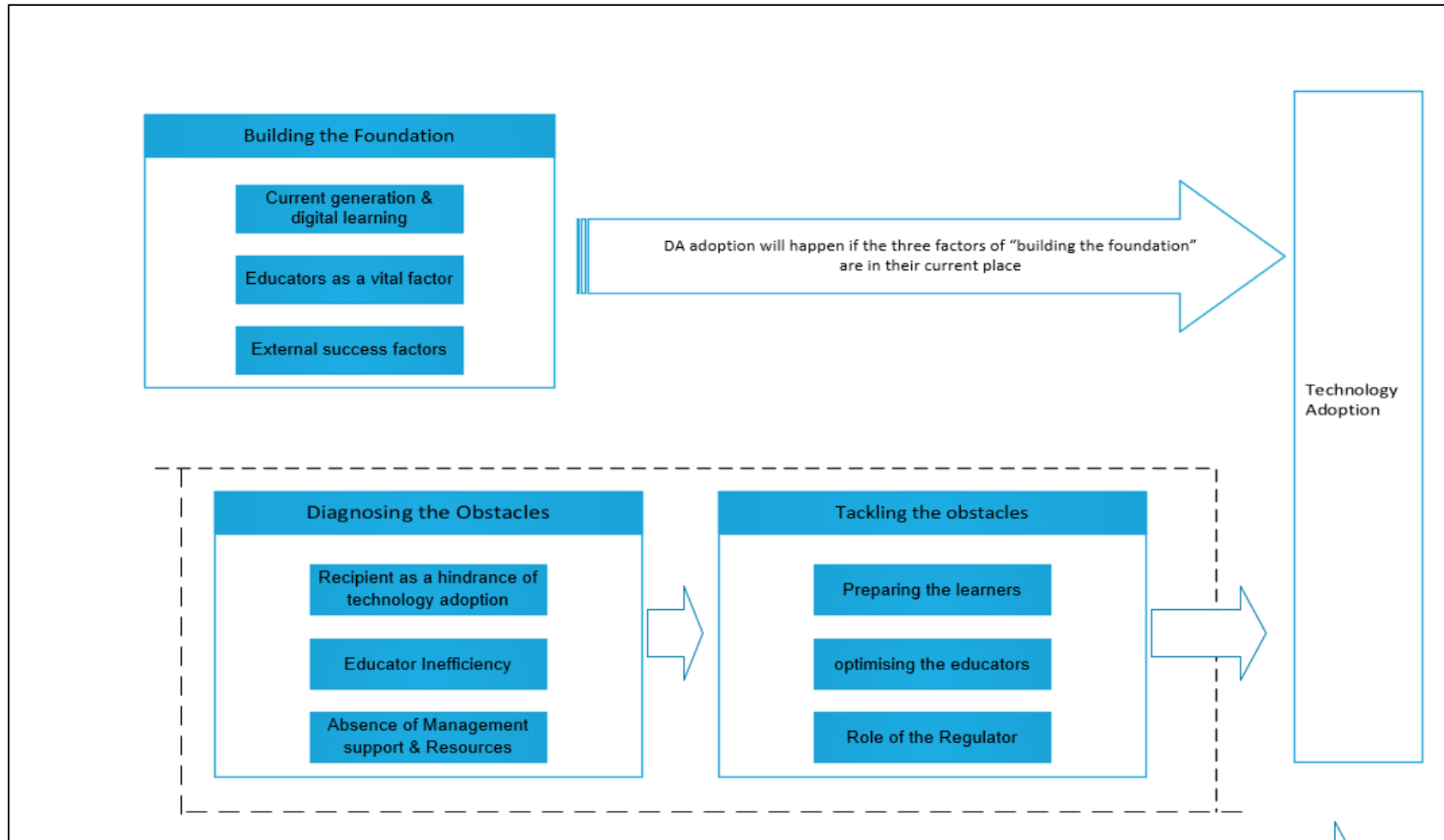
The third indicated strategy to overcome the 'Absence of Management support and resources' is termed as the 'Role of the Regulator.' Here, participants highlighted what they attempted to do to address this issue or what needs to be done to achieve DA adoption in EE. However, it can be observed that there is no clear strategy applied to overcome this issue, and some participants stated that significant changes are not expected unless directives come from the Ministry of Higher Education. Some participants requested training, and digital tools, yet few managements were responsive to these requests. Participants did not seem to be able to tackle the issue of workload, and generally, nothing positive emerged from the management's side. To summarise, this stage reflects the intended strategies to address the previously mentioned impeding factors, yet these strategies are not up to a satisfactory level. Therefore, for higher education institutions to achieve technology adoption, clear and effective strategies must be implemented to overcome the impediments. The table below summarises this stage.

Table 18: Tackling the Obstacles

Tackling the Obstacles
Recipient as a hindrance of technology adoption Lecturer Inefficiency Absence of Management support & Resources

The following model presents the process to achieve DA adoption with entrepreneurship educators in the context of this study in Oman.

Figure 7: A process of technology adoption in entrepreneurship education framework



Chapter 5: Discussion

5.1 Introduction

In this chapter, I discuss the findings of the current research, focusing on the factors that facilitate and impede technology adoption, the strategies employed to overcome these impeding factors, and the process of technology adoption. Through this discussion chapter, I provide a summary of each research question that this study aims to investigate and connect it to the existing literature.

First, I address the first research question by discussing the factors that facilitate technology adoption among entrepreneurship educators in Oman. Second, I tackle the second research question by examining the factors that impede technology adoption. Third, I explore the strategies, if any, implemented by entrepreneurship educators to overcome these impeding factors. Finally, I discuss the main research question about the process of technology adoption among entrepreneurship educators. This is all achieved by linking the Findings to the existing literature.

5.2 Discussion of the first research question: What factors facilitate the adoption of DA in EE teaching practices?

The data reveals three themes that facilitate the integration of digital artifacts in entrepreneurship education practices: 'current generation and digital learning,' 'educators as a vital factor,' and 'external success factors.'

The first theme revolves around the availability of various digital artifacts, and the learners of the current generation. Different types of digital artifacts such as images, videos, business model canvases, Blackboard, and Moodle play a crucial role in teaching entrepreneurship. Images and videos are the most prevalent digital artifacts among entrepreneurship educators. Participants explained how using such tools can help in explaining entrepreneurship related concepts and creating more practical teaching experience. Consequently, the accessibility of diverse digital artifacts within institutions is a key factor in their adoption (Gülbahar, 2007; Simeone, Secundo and Schiuma, 2017; Kirk and Rifkin, 2020). Besides, several recent research papers have discussed and called for further investigation and research into the potential of using digital tools in entrepreneurship, both generally and within entrepreneurship education specifically, such as (Rippa and Secundo, 2019; Sousa *et al.*, 2019; Elia, Margherita

and Passiante, 2020; Secundo *et al.*, 2020; Secundo, Rippa and Cerchione, 2020). For instance, Rippa and Secundo (2019) suggested numerous emerging research questions related to entrepreneurship and digital technology. In addition, incorporating DA into teaching practices is vital to educate the current generation, as highlighted by several participants. According to them, learners of the current generation are adept at using technology (Ratten, 2020) and exhibit increased engagement and interest in learning when utilising technological tools. This finding is supported by a number of studies conducted by (Briz-Ponce *et al.*, 2017; Nabi *et al.*, 2017; Mavlutova *et al.*, 2020a; Lesinskis *et al.*, 2023). As previously mentioned in the Findings chapter, learners demonstrate heightened attention spans and increased interaction when exposed to digital artifacts. The incorporation of various digital artifacts in entrepreneurship education was found to facilitate learning, integrate theory and practice, engage learners, and influence their intention to become entrepreneurs, as indicated by several participants. The same is indicated in a number of research papers, such as (Bellotti *et al.*, 2014; Isabelle, 2020; Monllor and Soto-Simeone, 2020; Secundo *et al.*, 2020; Viebig, 2022).

However, as indicated in the literature, other digital artifacts should also be effectively utilised in teaching entrepreneurship. Particularly, considering tools such as serious games can serve the purpose of supporting learners in creating virtual businesses, thereby enhancing and building their confidence to initiate a real-life business. Participants like Asif, Raiden, and Majan have elaborated that the use of simulations is an effective way to instil the required skills and knowledge in individuals. This approach aligns with the intended goal of offering entrepreneurship courses and other facilities, such as competitions, entrepreneurship labs, and incubators, to promote entrepreneurship and motivate learners to enrol in various entrepreneurial activities. Furthermore, a vital aspect of entrepreneurship is innovation and creativity. However, if educators do not incorporate these skills into their teaching practices, then something crucial might be missing.

The second theme discusses educators' role as a facilitating factor to DA adoption. Findings indicate that educators' awareness of the impotence of technology and their willingness to apply it in the classroom are crucial starting points for technology adoption (Wang, Wu and Wang, 2009; Joo, Park and Lim, 2018). Educators digital competency, where they can adeptly handle and apply digital tools, is also vital, and their digital competence can significantly impact the development of learners' digital skills (Liesa-Orús *et al.*, 2020; Núñez-Canal, de Obesso and Pérez-Rivero, 2022). This corroborates with the existing literature emphasising the importance of educators' skills and competency in technology adoption and acceptance (Deng *et al.*, 2014; Tondeur *et al.*, 2017). Therefore, educators, if aware of the importance and

effectiveness of using technology in teaching learners, are expected to seek ways to learn, use, and adopt DA in teaching entrepreneurship. Incorporating different digital artifacts in teaching will also possibly motivate learners to use technology effectively and potentially broaden their horizons on how technology can support the effectiveness of their potential businesses.

Furthermore, participants reported other actions and attributes that support technology adoption in EE, such as educators' various initiatives, working in teams, sharing knowledge, and their passion and interest in teaching entrepreneurship. Here, educators go beyond what is expected of them because they enjoy and love the subject, striving to present the topic in the most effective way possible (Peltonen, 2008; Otache, 2019). This sentiment aligns with Otache's (2019) findings, which demonstrate a significantly positive relationship between entrepreneurship educators and their influence on learners' entrepreneurial intentions and behaviours. The paper also recommends that entrepreneurship educators should be creative, innovative, passionate, embrace initiatives, and be able to inspire others, as also indicated in (Ratten and Usmanij, 2021). Such characteristics lead educators to be innovative in their teaching methods. Nowadays, educators can use different DAs such as serious games and applications to showcase their innovations and passion for entrepreneurship. Nicolle and Lou (2008) found that teamwork significantly influences technology adoption among educators. Al-Fadhli's (2009) research also reveals that learners believe that educators are a primary factor in their positive experience with technology adoption.

The third theme revolves around 'external success factors.' The data indicates that the presence of an entrepreneurship culture and appropriate facilities promotes technology adoption. This research also demonstrates that when management encourages and supports various initiatives led by entrepreneurship educators and provides them with the required facilities and training, educators become motivated and take initiatives. However, it is crucial to underscore the need for sustained investment in technology infrastructure to ensure the continued success of these initiatives. As mentioned in the previous chapter, when Majan (P10) wanted to organise an entrepreneurship exhibition, management offered their support to make the event successful. The significance of management support in technology adoption has also been emphasised in the literature by several studies, (Ismail, 2010; Alkharang and Ghinea, 2013; Núñez-Canal, de Obesso and Pérez-Rivero, 2022). In fact, Núñez-Canal, de Obesso and Pérez-Rivero (2022) recent paper have emphasised on the pivotal role of the HEI in enhancing the adoption of technology in teaching and learning of the current generation. Joensuu-Salo *et al.*, (2021) and Suharyati (2017) studies also confirmed the importance of university culture in enhancing the educators' entrepreneurial competencies. Therefore, the positive role of management, coupled with a sustained

commitment to invest in technology infrastructure, can significantly impact on the educators' adoption of digital artifacts in teaching practices.

Implementing and utilising different digital artifacts (DAs) requires identifying and providing them in the institutes in the first place. Several participants pointed out that they use multiple DAs such as smartboards, Moodle, and Business Model Canvas. A few stated that they have used other tools such as simulations, perhaps because they require financial investments and proper training. Some also mentioned having incubators and entrepreneurship labs, which ultimately support learners to engage in entrepreneurship in more practical ways. Nevertheless, there is still much work to promote more usage of DAs that can have effective results in motivating the learners to become entrepreneurs. Therefore, awareness and support from the managements facilitate providing different DAs in entrepreneurship education.

As this study adopted grounded theory as a methodology in exploring the elements that promote technology adoption, this approach has provided a broader perspective to examine any possible factors that can lead or impede technology adoption. Furthermore, as discussed in the literature review, the majority of current research (refer to: Teo *et al.*, 2011; Nawi *et al.*, 2017; Jena, 2020; Mustofa *et al.*, 2022) investigating technology adoption utilises models and theories such as TAM, UTAUT, and TPB. These frameworks primarily concentrate on attitudes and behaviours related to technology adoption. Nevertheless, this exploratory study sought to broaden the current scope of technology adoption, ultimately revealing the primary factors that drive technology adoption.

In summary, the above-mentioned themes represent the primary factors that facilitate the adoption of digital artifacts. Recognising these factors is crucial for understanding the current landscape and for fostering the process of technology adoption by entrepreneurship educators. These factors have been collectively referred to as 'Building the Foundation.' This designation implies that the presence of these factors leads to the ultimate goal, which is the adoption of digital artifacts in entrepreneurship education.

5.3 Discussion of the second research question: What factors impede the adoption of DA in EE teaching practices?

This research question aimed to explore various factors that hinder the adoption of DA in EE. The data identified three themes as impeding factors, which are: 'Recipient as a hindrance of technology adoption,' 'Educator Inefficiency,' and 'Absence of management support and resources.'

The first theme focuses on learners as an impeding factor. As noted by several participants in the previous chapter, learners are still not aware of the importance of technology in learning, leading to disengagement. They often adopt a passive learning approach, expecting to receive all information from educators (Charlton, 2006). The learners' educational background was also highlighted, as they may have been accustomed to listening without actively engaging in learning while in school. Consequently, they tend to maintain the same mentality in higher education. Thus, learners' mentality and attitudes towards entrepreneurship emerge as an impeding factor to DA in EE.

The existing literature has also emphasised this issue, indicating that learners can pose a barrier to technology adoption. For instance, Gregory *et al.*'s (2016) study identified learners' attitudes as one of the impeding factors for technology adoption in higher education institutions. The study suggested that learners need training in the use of digital technology for learning purposes. Other research papers, such as (Warner, Christie and Choy, 1998; Hung *et al.*, 2010), discuss this issue in terms of "learner's readiness" and highlight several major aspects related to readiness, including learners' digital skills, culture, and their perceptions and attitudes toward digital technology. The same notion was also illustrated in (Sánchez and Hueros, 2010; Bag, Aich and Islam, 2022).

In this research, some participants emphasised that learners do not engage in learning while using various types of digital artifacts, as they tend to focus more on theoretical learning to guarantee good grades. It appears that learners still struggle to understand how technology can help them link practical aspects to theoretical concepts. The role of the educators and management is crucial in presenting how technology can benefit their learning effectively. Furthermore, learners tend to treat entrepreneurship as any other subject that can be memorised for exams and assessments. Consequently, learners fail to recognise the subject as a potential gateway to future career opportunities, as also indicated in (Din, Anuar and Usman, 2016). Resistance and disengagement from learners can have an impact on the manner in which a lecture is delivered. For example, if educators face weak engagement or interaction from learners, they might be influenced to either adapt their approach based on learner preferences or deviate from the original plan for the lecture. Therefore, the positive role of the learners in embracing digital tools in learning is important (Teo, Zhou, *et al.*, 2019). Selim (2007) also indicated the vital role of the learners in using and adopting technology in learning. The fact that learners are an impeding factor to DA adoption reveals that the use of technology in teaching and learning process has been limited, and that learners have been taught in a theoretical manner. Learners seem to have gotten used to that approach, and now they may be reluctant to embrace new approaches. There needs to be more awareness campaigns for the learners to unfold the potential of learning through technology. Higher

education Institutions need to encourage the learners and present the possible ways in which using technology can be effective to the learning process. As presented in the literature, and from the participants, entrepreneurship teaching through DA can be effective and support learning. Therefore, there is a need for educators to support learners in this regard and show them how using technology help in understanding and practicing entrepreneurship concepts.

The second theme associated with impeding factors is 'Educator Inefficiency.' This theme encompasses various aspects, such as a lack of understanding and awareness of the importance of using technology in teaching entrepreneurship, minimal use of digital artifacts, teaching in a traditional manner dominated by lecturing style, and providing predominantly theoretical information with limited practical components. As indicated by several participants, the theoretical portion constitutes around 70% of the content, while the practical aspect accounts for only 30%. The literature highlights that successful integration and implementation of digital technology in teaching largely depends on the educator 's support, attitude, and beliefs (Hew and Brush, 2007; Keengwe, Onchwari and Wachira, 2008; Andoh Charles and Buabeng-Andoh, 2012). Secundo, Rippa and Meoli (2020) acknowledge the notion that there remains a lack of awareness regarding the use of digital technology in entrepreneurship education. A positive attitude towards the use of technology can translate into adoption and integration (Amhag, Hellström and Stigmar, 2019). No doubt that educators use technology for different purposes, yet they still need customised training to integrate technology in teaching and learning practices (Lei, 2009). Furthermore, educators are considered the primary actors with a strong impact on student learning outcomes (Amhag, Hellström and Stigmar, 2019). Therefore, the lack of awareness and understanding among educators regarding the importance of adopting technology affects their delivery of the subject. They tend to implement the traditional way of teaching and neglect other methods that learners may find more effective.

Educator incompetency in teaching entrepreneurship was another contributing factor to 'Educators' inefficiency.' The data from this research revealed that a significant number of educators teaching entrepreneurship are not adequately qualified, lacking relevant qualifications in entrepreneurship. Some have not had training opportunities on how to deliver the course. This finding was echoed in Al-shabibi (2020) recent study and (Bindah and Magd, 2016) in Oman. Amadi and Eze (2019) reported similar findings in Nigeria, revealing a shortage of qualified educators. Rashid (2019) observed the same issue in several countries, including Brazil, India, and South Africa. As indicated in the Findings chapter, in two HEIs, there is no signal qualified entrepreneurship educator teaching the subject, despite having more than thousands of learners enrolled in the course. Existing literature has explored the consequences of educator incompetence in various studies (Agbonlahor, 2016; Liu and Zhu,

2019; Iwu *et al.*, 2021). These studies indicate that educator incompetency may adversely affect learners' entrepreneurial intentions. Bennett (2006) study also indicate that educators' role is crucial in improving learners' creativity and innovativeness. Consequently, unqualified educators may struggle to present the subject attractively and effectively, lacking the necessary information and skills related to entrepreneurship (Iwu *et al.*, 2021). This deficiency can hinder learners' enthusiasm for enrolling in entrepreneurship potential practices, thereby impacting the overall quality of entrepreneurship education.

In this study, it has also been observed by one of the participants (P13-Hamed) that a number of educators teaching entrepreneurship are not genuinely interested in the subject matter. However, due to shortage of qualified educators, they are assigned to teach the subject. This situation highlights the potential influence that educators may exert on their learners. If the educators themselves lack enthusiasm for entrepreneurship, it raises the question of how learners are expected to develop interest in the subject. If educators do not teach with enthusiasm and motivation, their presentation of the subject may come across as mere information delivery, which can impact on the learners and their perception about the subject. Furthermore, insufficient preparation for lessons and a lack of ongoing learning to incorporate new ideas into the classroom can all influence the effectiveness of subject delivery. As previously mentioned, Oman aims to promote entrepreneurship among higher education learners. However, if educators are not prepared for this mission, the objective might not be achieved. While it is understandable that entrepreneurship is still recent in Oman, the importance of dedicated and enthusiastic educators cannot be overstated. These educators play a pivotal role in shaping the mindset and aspirations of the next generation of entrepreneurs. Their passion for the subject can ignite a similar passion in the learners, fostering a genuine interest in entrepreneurship. Conversely, if educators lack enthusiasm, it may hinder learners' engagement and hinder the development of an entrepreneurial mindset. Changing mindsets is a key advantage of offering entrepreneurship education (Wilson, 2008; Hultén and Tumunbayarova, 2020).

Workload was identified as another factor contributing to educators' inefficiency. Several participants revealed that educators are often overloaded. In addition to their high teaching load, they have other administrative responsibilities that tend to hinder their ability to explore and implement diverse teaching methods. The issue of educator workload is prevalent in the existing literature. Various studies have highlighted that workload act as an obstacle to technology adoption (Samarawickrema and Stacey, 2007; Nicolle and Lou, 2008; Neyland, 2011). It is evident that adopting new technologies require time for learning, practicing, and implementing before introducing them to learners. However, if educators lack sufficient time to prepare, learn, experience, and master these technologies, it is expected that they will not

feel confident presenting them to learners in the classroom. This sentiment was also echoed in the data, where participants emphasised that they could not introduce a specific digital tool without confidently mastering it, as stressed by participant (P23-Thelma).

Even presenting simple digital artifacts, such as pictures and videos, can sometimes be difficult and time-consuming because educators must search for the most suitable visual aids to describe the topic being discussed, as also highlighted in (Nicolle and Lou, 2008) paper. In Oman, a Muslim and conservative country, educators are also extremely cautious when selecting digital tools that do not conflict with the prevailing social culture. This aspect will be further elaborated.

The third theme concerning impeding factors is 'Absence of management support & resources.' This theme identifies management as a hindrance to technology adoption. According to the findings of this research, the management seems to lack awareness and understanding of the importance of entrepreneurship. Consequently, this results in the absence of an entrepreneurial culture, inadequate training, and insufficient financial budget allocated for proper infrastructure in higher education institutions. Several participants indicated that once directives come from management, the rest will follow. Undoubtedly, the management's role is crucial in technology adoption, as demonstrated in the current literature. For instance, Núñez-Canal, de Obesso and Pérez-Rivero (2022) recently conducted a study that emphasised the vital role of management in technology adoption. Similar findings were reported in (Anderson and Dexter, 2005) and (Gülbahar, 2007), which highlighted the importance of management's role in the effective use of technology. Alkharang and Ghinea (2013) found that management's awareness of the significance of adopting technology in teaching would result in providing the appropriate infrastructure and offering training on how to use digital tools in the classroom. Lack of proper infrastructure was also indicated in Al Naibi, Madarsha and Ismail's (2015) study, which revealed that the main factor affecting the use of Blackboard by faculty members in the Colleges of Applied Sciences in Oman was the lack of proper technology infrastructure. Therefore, the issue of improper infrastructure has been a long-standing concern in Oman.

In this research, Khalil and Rushdi, for instance, expressed that the management does not mind using traditional teaching methods. It appears that the management is satisfied as long as learners pass and complete the course but does not seem to pay attention to whether the course was effective for the learners or not. This lack of focus on effectiveness might be a reason why the management does not prioritise technology adoption. Zahi questioned if the management is aware of the purpose of providing entrepreneurship courses to the learners,

explicitly stating that the management does not seem to understand the requirements for effective teaching of entrepreneurship.

Furthermore, numerous studies have demonstrated that training is an effective approach to encourage educators to adopt specific digital tools in their teaching practices. For example, in an empirical study conducted by Balash, Zhang and Abu (2011), they interviewed 29 educators and found that digital tool training was one of the crucial factors motivating them to embrace technology in their teaching practices. Similarly, a literature review by Kebritchi, Lipschuetz and Santiago (2017) concluded that training is among the requirements for successful technology adoption. However, it is essential to note that "quality" training can make a significant difference in implementing and adopting technology in teaching and learning practices. Lawless and Pellegrino (2007) and Brinkerhoff (2006) both emphasise the importance of quality training in effectively integrating technology into educational practices. This notion aligns with the views of several participants in this study who expressed that general training was offered, but it was not related to specific digital tools that could be implemented in teaching entrepreneurship. On the other hand, participants who received effective training in digital tools were confident in using them in their teaching practices. For example, Nara indicated that through training, she was able to use Canvas confidently. Therefore, it is crucial for educational institutions to provide targeted, high-quality training to help educators effectively adopt and integrate digital tools into their teaching practices, particularly in the context of entrepreneurship education, where digital tools such as serious games require proper training, so that educators can confidently use them in their teaching.

Besides, it can be argued that general training is not sufficient to encourage educators to adopt technology in their teaching practices, particularly when incorporating new digital tools. Educators need to be trained and then followed up with inquiries about how they have utilised the training in their teaching practices. To motivate educators to benefit from the training, it may be useful to investigate the training's impact midway through or at the end of the semester. This was also highlighted by participant (P25-Ahmed), who mentioned that at the end of the course or semester, educators are asked about the training and whether they have implemented it or not, as well as their experience. Institutions typically invest in training, so it is crucial to gain the maximum benefits from the training offered. It is also important to recognise that some subjects require specific types of training. Therefore, managements should not focus solely on providing general training but rather assess the needs and requirements of each subject and then decide which types of training would be most beneficial. Otherwise, training may end up being a waste of time and resources. This sentiment was echoed by participants who mentioned that there was training, but not the kind they could utilise in teaching entrepreneurship. Tailored, high-quality training that meets the specific

needs of each subject, including entrepreneurship education, is essential for educators to effectively adopt and integrate digital tools into their teaching practices. Additionally, follow-up assessments and inquiries about the training's implementation can further motivate educators to make the most of the training they receive and maximise the benefits for their learners and institutions.

Financial constraints to technology adoption have been discussed in the existing literature, as seen in Tarus, Gichoya and Muumbo (2015) and Almaiah, Al-Khasawneh and Althunibat (2020) studies. In the latter research, all interviewees confirmed that financial issues are one of the impeding factors to technology adoption in Jordanian universities. It was also stated that these universities have limited resources and large budget deficits. Similarly, in this research, a number of participants echoed the same concern. Several reasons may explain why the management of higher education institutes does not invest financially in adopting technology. One reason could be that they have other priorities than spending on technology. This was highlighted by Rushdi and Ahmed, who stated that the management has other priorities to allocate resources, and they seem to be satisfied with what is available. As a result, they do not see a necessity to upgrade the current situation. Some may not see the benefits and value of investing in technology. This was pointed out by Ali, who said that the management thinks serious games are for fun, not learning. Thelma, on the other hand, indicated that the management has a budget but is not willing to spend on entrepreneurship-related matters. These actions suggest that the management still lacks understanding and awareness of the importance of promoting entrepreneurship in all possible ways. Since they have the decision-making power to allocate financial resources, educators need to work hard to convince their managements to spend on entrepreneurship-related matters.

While it is understandable that management may have limited financial budgets, there are other initiatives that can be undertaken to promote entrepreneurship. For example, supporting initiatives such as competitions and exhibitions can be effective. Offering in-house training or encouraging educators to seek training is another avenue. Seeking financial support from other stakeholders, such as companies and businesspeople, can be explored. Additionally, other private and governmental bodies may offer financial support. Ultimately, their role is crucial in promoting entrepreneurship.

Moreover, several participants noted that finding suitable digital artifacts on the internet for teaching can be challenging, particularly considering cultural differences. Educators need to be cautious when presenting videos in the classroom, as many of these videos originate from the West and may not be culturally appropriate for presentation. Examples of inappropriate content might include individuals are not dressed modestly or discussions about smoking and

alcohol. According to Almalki and Williams (2012), while digital technology supports learning, Arab and conservative environments need to be careful when incorporating digital resources into their teaching practices, taking cultural differences into account. Similar notions about cultural differences between the West and other countries were highlighted in studies by Mohamed, Abuzaid and Benladen (2008) and Sang *et al.* (2011). In Mtebe and Raisamo's (2014) study on the barriers to using open educational resources in higher education institutions (HEIs) in Tanzania, 43% of participants mentioned the difficulty of finding suitable digital resources. However, the term "suitable" was not explicitly defined, and whether it relates to cultural issues or not. A study by Almaiah, Al-Khasawneh and Althunibat (2020) discussed cultural factors, indicating that culture is a primary factor influencing e-learning adoption among learners. Nevertheless, the existing literature does not appear to include detailed studies investigating the issue of using western materials in teaching and learning and whether this presents any conservative concerns from the perspective of educators and learners. The limited studies generally discuss the topic, but the specific issues surrounding the use of Western materials are not discussed in depth. In this research, a number of participants indicated that using western DA can be an obstacle to be adopted in EE. Lack of finding suitable DA can impact in providing effective entrepreneurship teaching. It is essential for educators to consider cultural differences when selecting and utilising digital resources in their teaching practices.

To sum up, several factors hinder the adoption of DA in EE in Oman, many of which have been highlighted in the existing literature, including learners' attitude, educators' role, the absence of management support, and the required infrastructure. This research found that the use of Western DA in EE can be a hindrance to DA adoption, as educators may not feel comfortable presenting DA that could be deemed inappropriate within the local culture.

5.4 Discussion of the third research question: What strategies do entrepreneurship educators implement to overcome the impeding factors?

To answer this question regarding strategies to overcome the impeding factors, three themes were generated from the data: 'Preparing the learners,' 'Optimising the educator,' and 'Role of the regulator.' Participants presented some strategies they applied to address the hindrances related to learners, educators, and regulators. However, as stated earlier in the Findings chapter, there were no clear, widely implemented strategies to overcome the impeding factors. While several research papers have discussed the impeding factors to technology adoption, as presented in the above section, a limited number have addressed the strategies to overcome them. The following paragraphs will elaborate on this matter in detail.

In terms of the hindrances related to the learners, participants presented the strategies they apply to overcome the issues faced with learners. They pointed out different strategies, such as such as talking to learners to raise awareness about the importance of using technology in teaching. Some participants indicated that they also searched for teaching methods to create a more interactive teaching environment, and a few indicated discussing the matter with the management. Conversely, a number of participants such as Nara, Zahi, and Laura stated that they did not have a clear strategy to overcome issued related to learners. They had to adapt to the situation and do their best to teach in a way they assume is right. This scenario highlights that many institutes lack a proper procedure to investigate and discuss the hindrances that their educators face inside the classrooms. Therefore, each educator faces and deals with challenges according to what seems right to them. Gregory *et al.* (2016) have not indicated any strategy but recommended that learners require training on how to use digital technology in learning.

Concerning strategies related to 'Optimise the Educator,' again, the participants did not seem to have clear strategies to tackle the issue of the educator being an impeding factor, as Laura and Thelma stated, therefore, the situation has not changed. As indicated earlier in the Finding chapter, several hindrances confront educators, and they appear uncertain about where to begin. For instance, Arshad noted that the materials he received were old and had not been updated for a long time; nonetheless, he had to adapt and teach using what was available. Laura would prefer a more practical approach and less theoretical, yet the situation remains unchanged. Additionally, since the management or the head of the department does not actively seek educators' feedback on how to improve the course, little is expected to change. Even when educators presented their feedback about the course, as confirmed by Rushdi and Arshad, no action was taken to alter the situation. This could be a reason why others do not raise their concerns with the management, assuming that no actions will be taken to change the situation. In general, there do not appear to be any clear strategies that were implemented to overcome the above-mentioned challenges. Furthermore, while the existing literature highlights educators as an impeding factor to technology adoption, limited studies have discussed strategies to address this issue. Bell and Liu's (2019) research paper examined the challenges educators face; however, the paper did not mention strategies to overcome them.

Besides, the data from the current study indicate that, in some institutes, the management is aware of various impeding factors, yet no steps are taken to address the issues. For instance, the management is cognisant that there are few or no educators qualified to teach entrepreneurship, yet no substantial actions seem to be taken to rectify the situation. As indicated by participants such as Hamed and Haitham, their management did not affirm any commitment to seek qualified educators, nor did they provide customised training to current

entrepreneurship educators to enhance their teaching abilities. If there were any strategies, they likely originated from the educators themselves rather than from the management to ameliorate the current situation by employing better-qualified entrepreneurship educators. In Bindah and Magd (2016) paper, a number of challenges related to entrepreneurship educators in Oman were identified, and various strategies were proposed to enhance the situation. The paper suggests that teaching should be more interactive and practical. Additionally, it addresses the shortage of qualified entrepreneurship educators and proposes that this gap can be filled by leveraging resources such as alumni, local entrepreneurs, and business professionals.

It can be asserted that this situation is in line with the existing literature, where numerous studies acknowledge different impeding factors, yet few discuss strategies to overcome them. For example, some research papers discuss entrepreneurship educators as a challenge or an impeding factor, yet limited studies discuss strategies to overcome the situation. For instance, Buabeng-Andoh (2012), in a review of the literature, identifies different barriers that influence educators' adoption of technology and pointed out personal characteristics, institutional characteristics, and technological characteristics. However, the paper does not discuss any strategies to overcome the mentioned different factors. Agbonlahor (2016) also investigated the challenges of entrepreneurship education in Nigerian universities, yet no strategies to overcome the challenges were indicated. Kisanga and Ireson's (2015) study is one of the few studies that pointed out some of the strategies implemented to overcome the barriers of e-learning adoption in higher education institutes. In terms of raising awareness to the educators, it was indicated that "(a) Teachers professional development trainings (b) Training through individual consultations." Also, Johnson *et al.* (2012), study presented that faculty development bootcamps help educators to overcome technology adoption anxiety. The study also indicated that less is written about strategies to overcome technology adoption obstacles. Núñez-Canal, de Obesso and Pérez-Rivero (2022) recent paper could justify the limited studies about strategies as the topic is still recent, and therefore, it can take time to identify the proper strategies to the different impeding factors. Ratten and Usmanij (2021) paper present the current trends in entrepreneurship education and indicate that digital technology and entrepreneurship is still a recent topic. This could be the case, yet if institutes want to improve their situation and provide the best to the learners, they have to address the issues and find ways to overcome them; otherwise, the situation will remain the same.

The third theme focuses on the anticipated role of management in promoting technology adoption, referred to as the 'Role of the Regulator.' As mentioned earlier, management has been a hindering factor due to their incomplete understanding of entrepreneurship and its necessities, the distribution of teaching workload, the absence of budget allocation for

infrastructure improvement, and insufficient training and support. Participants expressed that the management's role fell short of expectations, and even though they communicated the challenges they faced in entrepreneurship, no significant progress was made, as pointed out by Zahi and Hana. Rushdi, Ibrahim, and Zahi further emphasised that the management would not seriously consider their needs unless there were directives from the Ministry of Higher Education. Moreover, participants reported discussing their concerns, such as high workload with the department head or management, but no action was taken, leaving educators to cope with it. This demonstrates that management makes decisions and plans without considering the educators' perspectives. On the other hand, educators seem to feel helpless, as they are unsatisfied with the situation but have limited ability to effect change; they must simply adapt to it.

The literature appears to lack comprehensive studies on strategies applied to overcome the role of management as a hindering factor. Ngah, Junid and Osman (2019) advised that future research should explore management support for diverse teaching methods. Kisanga and Ireson (2015) touched upon financial limitations faced by higher education institutions, suggesting collaborations with private sector and donor organisations or increased government funding as potential solutions. (P1-Abdul) mentioned that they sought different private organisations to support the development of their entrepreneurship lab, but as educators, pursuing companies for financial assistance may fall out of their scope of work, and not all educators may be willing to take this task. Almaiah, Al-Khasawneh and Althunibat, (2020) examined the challenges and factors influencing e-learning adoption, such as technological and infrastructure factors, but did not delve into strategies to address them. Similarly, Moerschell (2009) discussed various obstacles to technology adoption without offering solutions. Al-shanfari (2012) explained the challenges that entrepreneurship education in Oman and made some broad recommendations. Similarly, Bindah and Magd (2016) derived a list of recommendations from a study by (Wilson, 2008) and his colleagues, yet clear strategies about how to overcome the challenges have not been indicated.

Overall, entrepreneurship educators in Oman do not appear to have well-established strategies for overcoming various impeding factors caused by learners, educators and the managements. This became evident during interviews when participants were asked to describe their approaches for addressing the challenges they identified. Instead of providing specific strategies, the majority would offer suggestions or recommendations. Many paused when asked to state what has been done to tackle the hindrances, ultimately admitting they had done nothing. This issue is also reflected in the existing literature, where numerous studies discuss challenges and impeding factors related to technology adoption, but few outline strategies for overcoming them.

The following are some of the possible strategies that HEIs managements and educators can adopt to improve the use of technology in teaching and learning. There is a recent literature that highlights the immense capabilities of different emerging technologies that can be used in education in general, and in entrepreneurship education in particular. Leveraging the available digital tools can benefit the current learners, and potential entrepreneurs. As the World Economic Forum predicts, 70% of recently established businesses will involve digital platforms and business modules (*World Economic Forum*, 2022). Furthermore, McKinsey Global Institute estimates that 70% of companies will adopt some form of Artificial Intelligence (AI) (Prüfer and Prüfer, 2020).

AI can be defined as a simulation of human intelligence in machines that are programmed to think and act like human beings and can also learn from their environments and experiences. The core of AI is the ability of machines to mimic human cognition and behaviour, such as learning, performing different and multiple tasks, provide suggestion and solve problems (Pavlik, 2023). AI has the potential to revolutionise teaching and learning practices. (Rudolph, Tan and Tan, 2023). Using AI is one possible tool that can create effective learning, and personalised learning experience (Timms, 2016). AI can benefit entrepreneurs in building, designing, scaling, and launching new products and services (Obschonka and Audretsch, 2020; Chalmers, MacKenzie and Carter, 2021). In universities, AI can be a key role in boosting entrepreneurial activities. Therefore, learners are motivated to learn about entrepreneurial activities where AI learning is offered (Giuggioli and Pellegrini, 2023). Using such tools in teaching and learning about entrepreneurship can better prepare future entrepreneurs (Obschonka and Audretsch, 2020)

ChatGPT, a recently developed AI digital tool, presents significant potential in assessing entrepreneurs in different forms. Its capabilities extend to augmenting or even replacing tasks associated with idea generation, sales, scaling, content creation, and communication (Chalmers, MacKenzie and Carter, 2021; Short and Short, 2023). Furthermore, by leveraging data and facilitating well-informed reasoning, ChatGPT empowers entrepreneurs to make more informed decisions (Korzynski *et al.*, 2023). In the realm of entrepreneurial learning, ChatGPT acts as a catalyst for engagement and knowledge interaction. It enables learners to pose questions, reflect upon and challenge responses, and engage in in-depth discussions, ultimately fostering a deeper understanding of key concepts (Rospigliosi, 2023). Additionally, ChatGPT can assume the role of a mentor, guide, or assistant, providing answers, suggestions, and prompting further engagement (Rudolph, Tan and Tan, 2023). The ability to review and analyse outputs for potential improvement is another crucial aspect of ChatGPT,

as such reflection lies at the core of effective interactive and entrepreneurial learning (Bell and Bell, 2020; Rospigliosi, 2023). Beyond individual assessments, ChatGPT extends its functionality to encompass the evaluation of business models, marketing campaigns, and market data (Bell and Bell, 2023). Recognising the transformative potential of ChatGPT, educators are increasingly calling for its exploration within the teaching and learning environment (Pavlik, 2023). However, its innovative nature disrupts traditional teaching practices, and requires educators to review and adapt their teaching techniques (Qadir, 2023).

In the field of entrepreneurship education, a compelling argument exists for leveraging the power of Serious Games (SGs). Notably, gamification techniques employed in SGs are receiving growing attention as effective educational tools (Caponetto, Earp and Ott, 2014). Characterised as web-based applications, SGs blend instruction and gameplay (Bellotti *et al.*, 2009). Their inherent ability to provide "situated" learning experiences is a key driving force for their adoption in educational settings (Van Eck, 2006). This approach aligns with the "learning by doing" approach, where active engagement within simulated scenarios enhances learning effectiveness (Dale, 1969). Integrating SGs into entrepreneurship education offers distinct advantages. By placing learners in an active role, SGs promote critical thinking skills (De Grove, Mechant and Van Looy, 2010), and encourage proactive problem-solving (Bellotti *et al.*, 2014). Learners are presented with opportunities to explore various scenarios, assess potential outcomes, and experience the consequences of their decisions. The immediate feedback and evaluation provided by SGs are additional strengths, further solidifying the learning process (Jarvis and De Freitas, 2009). These characteristics directly address key competencies crucial in teaching entrepreneurship.

The landscape of entrepreneurship education is undergoing a transformative shift, driven by the immense potential of emerging technologies like AI, ChatGPT, and Serious Games. Entrepreneurship educators should harness these tools to enhance the learning experience of the learners.

5.5 Discussion of the main research question: How does the process of digital artifact adoption unfold by entrepreneurship educators?

As stated earlier, the facilitating factors, named as 'Building the Foundation' lead to and support technology adoption in entrepreneurship education. This occurs when the learners, the educators, and the management all are in the proper positions for technology adoption. While the impeding factors, named 'Diagnosing the Obstacles' do not lead to technology

adoption, and therefore there is a need to 'Tackle the Obstacles' to have a smooth process for technology adoption. The existing literature indicated and looked at different factors that can facilitate and/or impede technology adoption, yet a theoretical framework explaining how the process of technology adoption unfolds over time with entrepreneurship educators has not been investigated. To date, most studies (e.g. Kuratko, 2005; Neck and Greene, 2011; Nambisan, 2017; Secundo, Rippa and Meoli, 2020; Wang and Chiou, 2020) have been concerned with the intersection of digital technology and entrepreneurship education. However, none of them discuss how the process of technology adoption unfolds.

In addition, although some previous studies explore the process in entrepreneurship (Politis, 2005; McMullen and Dimov, 2013; Hjorth, Holt and Steyaert, 2015; Zozimo, Jack and Hamilton, 2017; Nucci, 2021), these studies focus on topics such as Entrepreneurship as/is a process, entrepreneurial learning process or process related to role model. Nevertheless, this study provides insights into entrepreneurship education and technology adoption process. Furthermore, this study examines at the process of technology adoption via investigating the facilitating factors, impeding factors, and strategies to overcome the impeding factors. With all these three questions, a framework of the process of DA adoption in EE was created.

In summary, this chapter has addressed the research questions posed by the study, provided an overview of the key findings, and connected them to the existing body of literature. While several studies have elucidated both facilitating and impeding factors, the present study has inquired about potential strategies to overcome the impeding factors. Nevertheless, the current literature offers limited insights in response to this particular question. Ultimately, the research presented a process of how DA adoption unfold in EE. The following chapter offers the conclusion of this study.

Chapter 6: Conclusion

6.1 Introduction

As indicated in Chapter 1, this PhD study was to investigate the process of DA adoption in EE in Oman. This is reflected in the main question guiding this study: **“How does the process of digital artifact adoption unfold by entrepreneurship educators?”** This question was addressed through three sub-research questions:

1. What factors facilitate the adoption of DA in EE teaching practices?
2. What factors impede the adoption of DA in EE teaching practices?
3. What strategies do entrepreneurship educators implement to overcome the impeding factors?

In this final chapter, I provide a summary of the main findings, theoretical and practical contributions, research implications, and limitations. I begin by revisiting the research questions and the main findings. Then, I indicate the theoretical and practical contributions of this study to the existing literature. Next, I explain the implications of this study. This chapter concludes by highlighting the study's limitations and recommendations for future research.

6.2 Summary of the main findings

This research investigated the process of how digital artifacts (DA) adoption unfold with entrepreneurship educators in Oman. In doing so, the study posed three research questions. The first concerns the factors that facilitate the adoption of DA. The second concerns factors that impede DA adoption. The third was strategies to overcome these impeding factors. A framework that proposes the process of DA adoption was created by answering these three research questions.

Regarding the first question, the findings reveal three main factors that facilitate DA adoption. First, the availability of different digital artifacts that can be adopted in teaching practices. Second, the availability of qualified and competent entrepreneurship educators who utilise digital artifacts effectively in their teaching practices. Third, the 'external factors' such as the availability of entrepreneurial culture, the required facilities, and the support from management are all paramount in aiding entrepreneurship educators to adopt DA into their teaching. This

question addresses what I termed 'Building the Foundation' within the framework proposed by this research.

The second question examined the factors impeding the adoption of DA in EE. The data reveals three main factors. The learners emerged as the primary impeding factor. This is due to their limited awareness of the importance of technology in learning, combined with their attitude towards learning entrepreneurship, often focused on marks and grades. Entrepreneurship educators represented the second impediment to adopting DA. Their teaching style leaned heavily towards traditional, educator lecturing rather than a more student-centred, interactive approach with minimal use of different DAs. A good number of the educators are incompetent to teach the subject because they lack the necessary qualifications to teach entrepreneurship. Moreover, their heavy workload leaves them with less time to explore and adopt new teaching methods. The study also highlighted that some educators faced challenges in identifying DAs compatible with the Omani culture, further impacting the adoption of DA in EE. The third primary factor is the limited management support and resources. The management of these higher education institutions appears to lean towards traditional teaching methods and may not fully promote an entrepreneurial culture. Additionally, there seems to be constraints in providing the necessary training and budget for the appropriate infrastructure. All acted as hindrances to DA adoption. This second research question refers what I termed 'Diagnosing the Obstacles.'

The third question of this study explores the strategies that entrepreneurship educators use to overcome impeding factors. The purpose of this question is to examine each impeding factor from the previous question and identify the strategies that educators use to overcome them. However, the data indicate that there are no clear strategies that educators apply to overcome impeding factors. There have been attempts to address these issues, yet they do not qualify as strategies. For example, participants were asked about the strategies implemented to deal with learners as an impeding factor. They mentioned actions such as talking to learners to raise their awareness about technology and implementing practical and engaging activities to increase their participation. This question highlights what I termed as 'Tackling the Obstacles.'

The main research question of this thesis is to explore the process of digital artifact (DA) adoption in Entrepreneurship Education (EE). A framework of this process was proposed in Chapter 4 by addressing the research questions. The facilitating factors, as indicated in the first sub-question, encompass three main elements that lead to the adoption of DAs in EE. However, the impeding factors identified in the current situation do not facilitate DA adoption; therefore, they must be addressed. Consequently, the third question aimed to examine the strategies implemented to overcome these impeding factors. Nevertheless, the data revealed

a lack of appropriate strategies to overcome these impediments. Therefore, there is a pressing need to address these hindering factors by identifying proper strategies to establish a comprehensive process for the adoption of DAs in EE.

6.3 Contributions

This PhD thesis offers several theoretical contributions to the broader fields of entrepreneurship and education, specifically within the intersection of entrepreneurship education and digital technology. First, it contributes to entrepreneurship education by developing a framework for how digital artifacts (DAs) adoption unfold over time. While numerous models and theories are applied to explore technology adoption, limited studies have employed the grounded theory approach for the same purpose. The application of grounded theory has enabled an investigation into how the phenomena of the technology adoption process unfolds. This process was created by examining the factors that facilitate and impede DA adoption. Unlike most previous studies that tested specific variables or factors in investigating technology adoption, this study offers a holistic picture of the process of DA adoption by exploring facilitating factors, impeding factors, and strategies to overcome the impeding factors. The study has unfolded the challenges required to be resolved to achieve smooth DA adoption. For instance, the data of this study identified that the learners' attitude can be an impeding factor. The adoption of technology in teaching and learning practices has not yet become the norm. Therefore, the majority of learners still believe in learning through memorisation and exams, focusing more on marks and grades than the outcomes of the course and its potential for shaping future careers. Additionally, this study found that sourcing culturally suitable DAs, mainly videos, can be a challenge due to the cultural values that the country preserves. In this regard, policymakers and educators will also have to take this matter into consideration when looking for other DAs such as serious games and other software to be adopted in the classroom environment.

Moreover, most studies investigating technology adoption have applied well-known theories and models such as TAM and UTAUT, employing quantitative methodologies (Nicolle and Lou, 2008; Teo, 2009; Abbasi *et al.*, 2015; Mehta *et al.*, 2019; Scherer and Teo, 2019; Teo, Venkatesh, *et al.*, 2019; Teo, Zhou, *et al.*, 2019).

These studies primarily focused on determining whether specific factors (variables) impact technology adoption, adopting a variance approach that does not fully address the process dimension of the phenomenon. In contrast, this study employs a qualitative methodology, grounded in grounded theory, to delve into the process of DA adoption, offering a

comprehensive perspective on potential facilitators and impediments. It proposes a framework outlining how technology adoption unfolds over time, distinguishing itself from other studies that, while qualitative, did not investigate the processual nature of technology adoption (e.g. Abdullah, Wahab and Shamsuddin, 2013; Acarli and Sağlam, 2015; Nicolle et al., 2018; Jacox et al., 2019).

This study set out to uncover strategies for overcoming obstacles that hinder the adoption of technology. However, it became evident that both practitioners and existing literature predominantly focus on acknowledging challenges and impediments rather than delving into strategies to address them. This research emphasises the importance of not only identifying and understanding the barriers to technology adoption but also actively exploring and formulating effective strategies to overcome these impediments. In essence, the study highlights the need for a more proactive and solution-oriented approach in addressing challenges related to technology adoption. In addition, this research also contributes to technology adoption literature by examining a wider range of DAs. While previous research has explored specific types of Das, such as the use of pictures (Ellborg, 2018), videos and films (Liguori and Winkler, 2020; Wraae and Walmsley, 2020), or serious games (Grivokostopoulou, Kovas and Perikos, 2019; Isabelle, 2020), informed by the work of (Nambisan, 2017; Rippa and Secundo, 2019), this thesis explored the different DAs' adoption in teaching and learning.

In this study, I explored the facilitating and impeding factors of technology adoption from the educators' perspective, as they are the main actors responsible for using and adopting technology in their teaching practices. Previous research (e.g. Nicolle and Lou, 2008; Tarhini, Teo and Tarhini, 2016; Dele-Ajayi *et al.*, 2019; Teo, Zhou, *et al.*, 2019)) has examined factors affecting technology adoption, yet they have not delved into the factors that impede the adoption. These studies tested certain factors and found their significance. Additionally, other studies such as (Teo, 2009; Alzahrani, 2019; Zheng and Li, 2020) did not approach the topic from the perspective of higher education educators, where the context, the level of learners and management differ compared to schools. Examining the research from educators' perspective is crucial, as they are the primary individuals standing in the frontline of the profession, serving the learners who are navigating their paths toward future careers.

6.4 Research implications

6.4.1 For policy makers (The Ministry and the Managements of the Institutes)

This thesis asserts that technology adoption is a process involving different parties: learners, educators, and management, with each playing a crucial role. However, based on the data from this research and the existing literature, the three key parties in technology adoption are the Ministry of Higher Education, managements of the HEIs, and educators. The Ministry serves as the policymaker and regulator, holding the authority to establish guidelines for teaching entrepreneurship, provide necessary infrastructure, and determine the qualifications of educators teaching the subject. In the Omani context, the Ministry initially offered training (Certified Entrepreneurship Educators) in collaboration with international academic institutes. However, this training was only provided for a few years. The research indicates that ongoing training is still necessary to qualify educators.

Furthermore, since the Ministry is responsible for creating the entrepreneurship syllabus, it has the potential to furnish a repository of Digital Artifacts (DAs) that educators can integrate into their teaching practices. This would address the issue of educators struggling to find suitable DAs, saving them time and energy, and ensuring consistency across different institutions in entrepreneurship education (EE). Additionally, institutions should actively encourage entrepreneurship educators to invest in EE, allowing them to create and share their own DAs. This collaborative effort across institutions can build a shared resource bank aligned with cultural values, providing educators with options for customisation, tailoring, and collaborative resource sharing.

Based on the data, it is evident that leveraging local experiences yields greater effectiveness. Consequently, it is advisable to seek out local entrepreneurs and employ their respective cases where possible. The Ministry can also encourage more academics to specialise in entrepreneurship education, which can help offer qualified educators teaching the subject. The Ministry can also conduct training, workshops, and seminars to raise awareness of the importance of entrepreneurship education. As indicated earlier, employment in Oman is becoming challenging, and entrepreneurship can be one solution. This can be one of the ways in which learners can see the importance of entrepreneurship to them and their country.

The management can provide customised training, and with the availability of online training, they need to encourage entrepreneurship educators to enrol in them. Training is an effective way to facilitate technology adoption. Additionally, managements need to consider the workload and its consequences in providing quality education to the learners. Overloaded educators may be hindered from exploring new methods of teaching. With the availability of

different digital artifacts (DAs), such as serious games and applications that can aid in the virtual learning of entrepreneurship, the management should provide such digital tools to the learners, which could motivate them to pursue entrepreneurship. As indicated in the Findings chapter, participants who experienced simulation programs found them to be very beneficial. Furthermore, although some institutes have started providing incubators and entrepreneurship labs to learners to safely practice entrepreneurship, it is time to implement them in all institutes. The availability of such facilities supports learners in enrolling in entrepreneurship activities and emphasises their importance to the learners.

6.4.2 For Practitioners (Entrepreneurship educators)

Educators also play a predominant role in technology adoption and in improving teaching approaches. With technology disruption and learners using it almost every day, educators can orient them towards more learning through technology. Educators need to update their teaching approaches and reduce theoretical, teacher-centred, and teacher-led learning to engage in more practical hands-on learning experiences. Educators need to keep updating themselves by engaging in more online, continuing professional development (CPD) learning, as many workshops and training sessions are conducted online. Leveraging emerging digital technologies, including AI, ChatGPT, and serious games, should be a top priority in entrepreneurship education. By doing so, educators infuse creativity into teaching and enhance the learning experience of the learners. Though it is understandable that management is responsible for creating positive changes in learning and teaching, it is also the role of educators to inform the management of their requirements for an up-to-date teaching style.

Educators' role is crucial in motivating learners to consider entrepreneurship. By understanding the importance of their passion, educators can inspire learners. Active engagement through discussions, real-world and local success stories, and interactive activities that showcase the practical applications of entrepreneurship can all contribute. This multifaceted approach not only enhances learners' understanding but also inspires them to explore and embrace entrepreneurial opportunities.

6.5 Limitations and future studies

This study has several limitations. First, while qualitative research provides an opportunity to explore in-depth topics, the findings and data interpretations may be subject to the biases of the researcher (Creswell and Poth, 2018). Although efforts were made to minimise subjectivity through rigorous data analysis and interpretation, the inherent interpretive nature of qualitative research introduces the potential for researcher bias. Secondly, relying solely on interviews for data collection may have limitations, especially when aiming to develop a framework. Therefore, future research in the same area could employ a mixed methods approach or include additional methods, such as focus groups and observations, could offer richer insights and a more comprehensive understanding of the process of technology adoption. Thirdly, this study exclusively interviewed educators. However, the data suggests that the management and the Ministry of Higher Education played a role in impeding process technology adoption. Therefore, conducting interviews with participants from the Ministry of Higher Education and institutional management could unveil additional insights, offering a broader perspective on the issue from different stakeholders. The perspective of the learners is also vital; hence, future research could delve into how learners absorb entrepreneurial skills through the use of various digital artifacts in their learning experiences.

Fourth, the study disclosed several factors impeding the technology adoption process. Therefore, it would be interesting to conduct a comparative study between another Arabic/Gulf country to see if they face the same scenario. Furthermore, a comparative study with a developing country may also yield interesting findings. Investigating technology adoption in a different setting could provide outcomes. Furthermore, the findings pertaining to the third research question, which explores the strategies used to overcome the impeding factors, lack rigor. It seems that there are no clear strategies that educators consistently implement to overcome these obstacles. Consequently, additional research is warranted to delve deeper into this question. It would be beneficial to investigate how educators can develop and implement effective strategies to overcome technology adoption challenges. Finally, this study developed a framework to illustrate the process of technology adoption. Other researchers could test or apply the framework if it is applicable to their context. Furthermore, this PhD study's data revealed that learners, educators, and management can all be impeding factors, due to different reasons. It would be interesting to explore each in detail and determine how, why, and strategies to overcome them as impeding factors.

6.6 Final Remark

This research produces a framework to elucidate the process of how DA adoption unfolds in EE in Oman. In doing so, the research answered three research questions which were about the factors facilitating DA adoption, the factors hindering DA adoption, and the strategies to overcome the impeding factors. Proper application of DA in EE can enhance the effectiveness of entrepreneurship course, which aims in creating more local entrepreneurs, think or work in an entrepreneurial way, or at least increase the awareness and understanding of it individually and collectively.

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Appendices

Appendix 1: Interview guide

Section A: personal details

1. Name of the Institution:

.....

2. Age group:

☐25-30 ☐31-35 ☐36-40 ☐41-45 ☐46 and above

3. Entrepreneurship Qualification(s):

☐Bachelor ☐Master ☐ PhD ☐others:

4. Have you taken any teaching course related to entrepreneurship teaching?

☐Yes: Name of the course:

..... ☐No

5. Number of years in teaching entrepreneurship?

6. How and why did you get into teaching entrepreneurship?

Section B: Main Research Questions

RQ 1: factors that facilitate the adoption of DA in EE teaching practices

1. As a lecturer, Which DA do you use in EE ? how often do you use them? Why ?
2. What are the different facilities available that to encourage you to use DAs in EE?
PD/ Infrastructure/ Training ?
3. How important do you think that using DA in EE?

RQ 2: factors that impede the adoption of DA

4. As a lecturer, Do you think that there are some factors that can hinder the adoption of DA in EE? Can you provide examples, please?
internal and/or external factors

workload/ Facilities provided / training & technical support

5. From your experience, what do you think is the main barrier of not using DA in EE?
6. How do you find learning new technology? How much time does it take you to learn/master it? Have there been any training in relation to use DA?
7. How easy or difficult to find a suitable DA from the internet?

**RQ 3: strategies that entrepreneurship educators implement to overcome the
impeding factors**

8. What are the different strategies you use to overcome the above-mentioned
impeding factors?
9. Can you provide some suggestions on how to improve entrepreneurship teaching in
term of using DAs?
10. What would you like to change about the current teaching methods?
11. is there anything else you wish to add?"

Appendix 2: University Ethics Committee Approval Letter



College of Business, Arts and Social Sciences Research Ethics Committee
Brunel University London
Kingston Lane
Uxbridge
UB8 3PH
United Kingdom
www.brunel.ac.uk

1 August 2022

LETTER OF APPROVAL

APPROVAL HAS BEEN GRANTED FOR THIS STUDY TO BE CARRIED OUT BETWEEN 01/08/2022 AND 31/12/2024

Applicant (s): Mr Salim Al Rawahi

Project Title: Exploring the process of digital artifact adoption in entrepreneurship education

Reference: 36721-LR-Jul/2022- 40531-1

Dear Mr Salim Al Rawahi

The Research Ethics Committee has considered the above application recently submitted by you.

The Chair, acting under delegated authority has agreed that there is no objection on ethical grounds to the proposed study. Approval is given on the understanding that the conditions of approval set out below are followed:

- Recruitment by email - You must ensure that the collection of email addresses of those you wish to contact is lawful. Do not send mass recruitment emails by entering multiple email addresses in the 'To' field of your email message. You should email each person individually.
 - You can recruit participants who work at any organisation/company using contact information which is publicly available or contact information which is available to you as part of your personal contacts/social media network or professional network that you belong to.
 - On the Participant Information Sheet, under Complaints, please remove the details for UREC and Derek Healy.
 - The agreed protocol must be followed. Any changes to the protocol will require prior approval from the Committee by way of an application for an amendment.
- Please ensure that you monitor and adhere to all up-to-date local and national Government health advice for the duration of your project.

Please note that:

- Research Participant Information Sheets and (where relevant) flyers, posters, and consent forms should include a clear statement that research ethics approval has been obtained from the relevant Research Ethics Committee.
 - The Research Participant Information Sheets should include a clear statement that queries should be directed, in the first instance, to the Supervisor (where relevant), or the researcher. Complaints, on the other hand, should be directed, in the first instance, to the Chair of the relevant Research Ethics Committee.
 - Approval to proceed with the study is granted subject to receipt by the Committee of satisfactory responses to any conditions that may appear above, in addition to any subsequent changes to the protocol.
 - The Research Ethics Committee reserves the right to sample and review documentation, including raw data, relevant to the study.
 - If your project has been approved to run for a duration longer than 12 months, you will be required to submit an annual progress report to the Research Ethics Committee. You will be contacted about submission of this report before it becomes due.
- You may not undertake any research activity if you are not a registered student of Brunel University or if you cease to become registered, including abeyance or temporary withdrawal. As a deregistered student you would not be insured to undertake research activity. Research activity includes the recruitment of participants, undertaking consent procedures and collection of data. Breach of this requirement constitutes research misconduct and is a disciplinary offence.

Professor David Gallear
Chair of the College of Business, Arts and Social Sciences Research Ethics Committee
Brunel University London

Appendix 3: Email to Potential Participants

Dear,

Hope this mail finds you well.

I am a Doctoral Researcher in Brunel Business School at Brunel University London. The title of my research is “**Exploring the process of digital artifact adoption in entrepreneurship education.**”

I would like to invite you to take part in my research study. The study aims to investigate how technology adoption, in particular, digital artifacts (like pictures, videos, and serious games) in entrepreneurship education process unfolds. I am interested in finding out the main factors that facilitate and impede technology adoption, and the different strategies that entrepreneurship educators use to overcome the impeding factors.

As you are one of the entrepreneurship educators, I would like to invite you for an interview to discuss the topic.

Attached is the Participant Information sheet that provides more detailed information about my research topic.

Could you please also sign the attached **Consent Form** and send it back to me. This is an important university protocol prior to the online interview.

Thank you for taking the time to read and respond to this email.

Regards,

Salim Al Rawahi|

Doctoral Researcher, Brunel University London