



Faculty of Technology Management and Technopreneurship

**EXPLORING THE REQUISITE ENTREPRENEURIAL SKILLS OF
EIGHT SELECTED SECTORS RELATED TO INDUSTRIAL
REVOLUTION 4.0 IN MALAYSIA**



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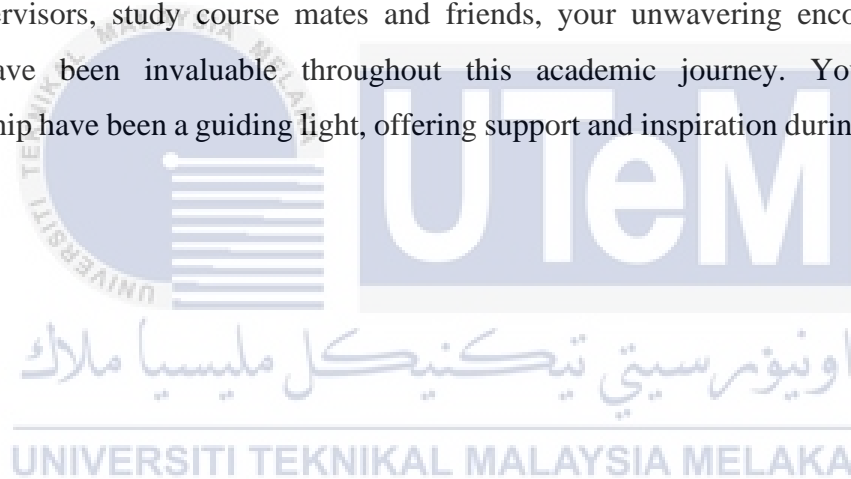
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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DEDICATION

Alhamdulillah, all praises to Allah the Almighty. I dedicate this thesis to my beloved parents—my father, a distinguished businessperson and entrepreneur whose wisdom and experiences have illuminated my path, and my mother, whose unwavering love and support have been my constant motivation. They have been my bedrock, instilling in me the resilience to navigate challenges and persist in the face of adversity. This work is also dedicated to my siblings, whose presence has been a driving force, inspiring me to evolve and support them as a better sibling in every way.

To my supervisors, study course mates and friends, your unwavering encouragement and guidance have been invaluable throughout this academic journey. Your advice and companionship have been a guiding light, offering support and inspiration during both triumphs and trials.



ABSTRACT

This qualitative study addresses the critical need to identify and understand specific requisite entrepreneurial skills essential for navigating Industry 4.0 of the eight selected sectors in Malaysia. In the era of Industry 4.0 (IR4.0), traditional entrepreneurial paradigms are increasingly insufficient for achieving success. The rapid technological advancements and complex business environments introduced by IR4.0 demand a nuanced set of skills and strategic approaches that many current entrepreneurs lack. Despite advancements, there remains a significant theoretical gap regarding these skills and their application in IR4.0 context. The study aims 1) To explore and analyze the challenges faced by entrepreneurs operating in the context of IR4.0. 2) To identify and examine the requisite entrepreneurial skills required for success in IR4.0. 3) To investigate effective strategies and approaches for entrepreneurs to overcome the challenges in IR4.0 and leverage their entrepreneurial skills effectively. Drawing on a phenomenological case study approach, which focuses on capturing the lived experiences and essence of participant's perspectives, eight in-depth interviews and seven Focus Group Discussions (FGDs) were conducted using purposive sampling techniques with entrepreneurs, industry leaders, senior executives, government agencies, and auditors. Participants, sourced from the Malaysian Investment Development Authority (MIDA) across diverse IR4.0 sectors (Electrical and Electronics, Chemical, Mechanical and Engineering, Aerospace, Medical Devices, Automotive, and labor-intensive sectors), provided insights crucial to understanding of the requisite entrepreneurial skills. Recorded interviews underwent verbatim transcription and were analyzed thematically elucidated four crucial domains of entrepreneurial skills: entrepreneurial mindset and attitude, cognitive abilities, business strategic skills, and resource management skills. Identified challenges include funding inadequacies, leadership dynamics, governance influences, awareness gaps, the need for change agents, and network disconnection. By addressing these challenges and leveraging the identified skills, this research contributes nuanced insights to the entrepreneurship literature within IR4.0, offering practical strategies for entrepreneurs to navigate and thrive in this transformative industrial era.

MENELITI KEMAHIRAN KEUSAHAWANAN BAGI LAPAN SEKTOR TERPILIH BERKAITAN REVOLUSI PERINDUSTRIAN 4.0 DI MALAYSIA

ABSTRAK

Kajian kualitatif ini menangani keperluan kritikal untuk mengenal pasti dan memahami kemahiran keusahawanan khusus yang diperlukan untuk mengharungi Industri 4.0 dalam laman sektor terpilih di Malaysia. Dalam era Industri 4.0 (IR4.0), paradigma keusahawanan tradisional semakin tidak mencukupi untuk mencapai kejayaan. Kemajuan teknologi yang pesat dan persekitaran perniagaan yang kompleks yang diperkenalkan oleh IR4.0 menuntut satu set kemahiran dan pendekatan strategik yang lebih mendalam, yang kebanyakan usahawan masa kini kurang miliki. Walaupun terdapat kemajuan, terdapat jurang teori yang signifikan mengenai kemahiran ini dan penerapannya dalam konteks IR4.0. Kajian ini bertujuan 1) Untuk meneroka dan menganalisis cabaran yang dihadapi oleh usahawan yang beroperasi dalam konteks IR4.0. 2) Untuk mengenal pasti dan meneliti kemahiran keusahawanan yang diperlukan untuk kejayaan dalam IR4.0. 3) Untuk menyiasat strategi dan pendekatan yang efektif bagi usahawan untuk mengatasi cabaran dalam IR4.0 dan memanfaatkan kemahiran keusahawanan mereka dengan berkesan. Dengan menggunakan pendekatan kajian kes fenomenologi, yang memfokuskan pada menangkap pengalaman yang dilalui dan inti perspektif peserta, laman wawancara mendalam dan tujuh Perbincangan Kumpulan Fokus (FGD) telah dijalankan menggunakan teknik pensampelan bertujuan dengan usahawan, pemimpin industri, eksekutif kanan, agensi kerajaan, dan juruaudit. Peserta, yang diambil dari Lembaga Pembangunan Pelaburan Malaysia (MIDA) merangkumi pelbagai sektor IR4.0 (Elektrik dan Elektronik, Kimia, Mekanikal dan Kejuruteraan, Aeroangkasa, Peranti Perubatan, Automotif, dan sektor intensif buruh), memberikan pandangan yang penting untuk pemahaman tentang kemahiran keusahawanan yang diperlukan. Wawancara yang dirakam telah ditranskripsikan secara verbatim dan dianalisis secara tematik, menjelaskan empat domain penting kemahiran keusahawanan: mindset dan sikap keusahawanan, kebolehan kognitif, kemahiran strategi perniagaan, dan kemahiran pengurusan sumber. Cabaran yang dikenal pasti termasuk kekurangan dana, dinamika kepimpinan, pengaruh tadbir urus, jurang kesedaran, keperluan untuk agen perubahan, dan pemutusan rangkaian. Dengan menangani cabaran-cabaran ini dan memanfaatkan kemahiran yang dikenal pasti, kajian ini menyumbangkan pandangan yang mendalam kepada literatur keusahawanan dalam IR4.0, serta menawarkan strategi praktikal untuk usahawan mengharungi dan berjaya dalam era industri yang transformatif ini.

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LIST OF ABBREVIATIONS

| | |
|--------------|---|
| AI | Artificial Intelligence |
| FGDs | Focus Group Discussions |
| GEM | Global Entrepreneurship Monitor |
| HRD | Human Resource Development |
| IoT | Internet of Things |
| IR4.0 | Industrial Revolution 4.0 |
| LM | Lean Manufacturing |
| MIDA | Malaysian Investment Development Authority |
| MITI | Ministry of Investment, Trade, and Industry |
| NIMP | New Industrial Master Plan |
| OJT | On Job Training |
| PR | Public Relation |
| RA | Readiness Assessment |
| SMEs | Small and Medium- sized Enterprises |

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LIST OF PUBLICATIONS

Noorzelan, M. R., Kamarudin, M. F., and Masrom, N. R., 2024. Exploring the Challenges of Industry 4.0 Entrepreneurs: A Grounded Theory Approach. *Journal of Technology Management and Technopreneurship (JTMT)*, 12(1), 10–23. Retrieved from <https://jtmt.utem.edu.my/jtmt/article/view/6083>

Noorzelan, M. R., Kamarudin, M. F., and Masrom, N. R., Rozaki, Z., 2024. Future Agropreneur Employability Readiness in Evolving Market: A Grounded Theory Approach. *5th International Conference on Agribusiness And Rural Development (IConARD 2024)*.



CHAPTER 1

INTRODUCTION

1.1 Introduction

This research chapter provides a comprehensive overview of the study's context, objectives, and significance. It begins by outlining the background, which explores the transformative impact of the Fourth Industrial Revolution (IR4.0) on industry and the requisite entrepreneurial skills needed in this digital age. The chapter identifies the problem statement, emphasizing the current lack of understanding regarding these requisite entrepreneurial skills. The research questions are designed to investigate and identify the requisite entrepreneurial skills required for success in the IR4.0 era. This includes addressing the challenges entrepreneurs face and how they can effectively leverage their skills to navigate this new industrial landscape. The study's objectives are clearly defined to explore the challenges encountered by entrepreneurs in IR4.0, identify the necessary skills for success, and investigate strategies to overcome these challenges. The significance of this study is highlighted by its potential contributions to both theoretical knowledge and practical applications. It aims to inform entrepreneurship education, policy-making, and industry practices, particularly within the Malaysian context. This chapter establishes the context for the study and emphasizes the significance of comprehending and honing entrepreneurial skills for success in IR4.0.

1.2 Background of the Study

The Fourth Industrial Revolution (IR4.0) has transformed the way industries operate, bringing about disruptive changes in technology, business models, and organizational structures (Schwab, 2016). The digitalization of industrial processes has created new opportunities for entrepreneurs to innovate and create value in the global economy (Deloitte, 2020). Entrepreneurs worldwide are leveraging these technologies to innovate, drive economic growth, and create value. However, the rapid pace of technological change in IR4.0 also presents challenges for entrepreneurs to adapt and develop the necessary skills to succeed in this dynamic environment (Kao, 2018). In the global context, entrepreneurs must navigate a multifaceted

environment that demands proficiency in emerging technologies, agility in business models, and the ability to harness data-driven insights. The entrepreneurial landscape has been notably altered by the Fourth Industrial Revolution, demanding a reevaluation of the skills (Avny, 2021; Kruger, 2020). Entrepreneurs navigating this era must possess skills that allow them to adeptly maneuver through various technology layers and unlock innovative opportunities (Kruger, 2020).

Zooming into the Malaysian context, the country is actively pursuing IR4.0 initiatives through policies and programs aimed at enhancing industrial capabilities and fostering innovation. The National Entrepreneurship Policy (NEP) 2030 of Malaysia is a strategic framework designed to foster and support entrepreneurship in the country. It aims to create a sustainable entrepreneurial ecosystem that promotes economic growth and job creation (Rahman and Raman, 2024) and builds upon previous initiatives like the New Economic Policy to develop competitive commercial and industrial societies (Saifuddin et al., 2022). However, Malaysian entrepreneurs encounter challenges similar to their global counterparts, including the need for comprehensive skill development and access to resources that enable them to capitalize on IR4.0 opportunities. Addressing these challenges is crucial for Malaysia to fully leverage the potential of IR4.0, ensuring that its entrepreneurial ecosystem can contribute effectively to the nation's economic growth and competitiveness.

In Malaysia, the main government organization charged with encouraging and facilitating investments in the nation is the Malaysian Investment Development Authority (MIDA). MIDA is a center for companies looking to start up or grow operations in Malaysia and is run by the Ministry of International Trade and Industry (MITI). MITI is a government ministry tasked with developing and enacting laws regarding trade, investments, industrial growth, and global trade negotiations. In addition to supporting the expansion and development of numerous industries in Malaysia, MITI plays a critical role in promoting and facilitating trade and investment activities there. MIDA has been and continues to be a steadfast ally for both foreign and domestic businesses, empowering them to capitalize on opportunities and propel their growth and innovation (MIDA Newsletter, 2022).

MITI, through MIDA, supports SMEs in becoming players in the IR4.0 industry. Qualified small-to-medium enterprises are eligible to receive funding of up to RM500,000 for

Industry 4WRD Readiness Assessment (MIDA, 2023). According to the Malaysian Investment Development Authority (MIDA), several significant manufacturing industries have been identified, including the Electrical and Electronics industry (E&E), automobile industry, textile industry, wood-based industry, steel industry, and petrochemical industry. These industries play a vital role in the nation's growth (Othman et al., 2022). Besides that, Ratnasingam et al., (2020) stated that in 2019, a survey conducted by the Malaysian Industrial Development Authority in collaboration with the Malaysian Productivity Corporation (MPC) found that the automotive, electrical and electronics, aerospace, chemical industries, petroleum refining and related industries, were ahead of the wood products and furniture industries in terms of the implementation of lean manufacturing (LM).

Traditional company models of entrepreneurship in previous industrial revolutions have been challenged by this transformation, opening possibilities for new types of entrepreneurs that make use of cutting-edge technology like artificial intelligence, blockchain, and the Internet of Things. Intelligent machines have ushered in a decentralized, self-organizing paradigm, fundamentally altering the traditional top-down production hierarchy (Koh et al., 2019). A rising number of people are beginning to realize that the present entrepreneurship paradigms might not be adequate for success in the IR4.0 era. The advent of emerging technologies has sparked a paradigm shift in production, transitioning from machine-centric manufacturing to digital manufacturing (Koh et al., 2019). Thus, it is necessary to create a new model of entrepreneurship that fits with the current trends and problems as well as the entrepreneur skills in the era of IR4.0.

Several recent studies have highlighted the importance of studying entrepreneurial skills in the IR4.0 era. For instance, Radu and Radu (2020) noted that understanding the specific skills required to succeed in the IR4.0 era is essential for promoting innovation, growth, and competitiveness in the business world and Tan (2021) also emphasized the importance of developing a comprehensive understanding of the skills required for entrepreneurship in the IR4.0 era.

In the context of IR4.0, previous research has underscored the imperative need to fundamentally redefine the landscape of entrepreneurship. Tang and Tan's (2021) groundbreaking study delved deep into the challenges posed by impending technological

upheavals, asserting that conventional business structures are ill-equipped to navigate the complexities of the digital age. The research highlighted the pressing demand for entrepreneurs to cultivate novel abilities and adopt innovative attitudes that resonate with the demands of IR4.0.

Moreover, Zhou and Li (2019) conducted an extensive analysis, emphasizing the pivotal role of entrepreneurial evolution in the face of rapid technological advancements. Their study illuminated the fact that the established norms of entrepreneurial practices might no longer suffice in the era of IR4.0. Zhou and Li stressed the urgency for entrepreneurs to embrace transformative strategies, underscoring the significance of proactive adaptation and continuous learning to thrive amidst the digital revolution.

Additionally, Kaur and Singh's (2019) comprehensive research reinforced the notion that honing entrepreneurial skills are paramount in navigating the disruptive waves of technological change. Their findings shed light on the indispensable nature of skills development, indicating that entrepreneurs must possess a diverse skill set, including digital literacy, innovative problem-solving, and adaptability. Kaur and Singh's study emphasized that these skills are not just advantageous but essential for entrepreneurs aiming to reshape their ventures successfully in the IR4.0 landscape.

While there have been some studies examining the skills pertinent to entrepreneurship, it is imperative to acknowledge the gaps in the existing literature. Previous research endeavors, such as the seminal work by Barbara Bird (2019) in identifying entrepreneurial skills and the comprehensive study conducted by Shabir and Kassim (2019), have explored various facets of entrepreneurial skills. However, these studies primarily focused on traditional business paradigms and did not delve deeply into the nuances of IR4.0.

This highlights the necessity for further investigation to bridge the existing knowledge gap and comprehend the evolving landscape of entrepreneurship in the contemporary context. To address this research void, our study embarks on a qualitative analysis aimed at investigating and identifying the crucial requisite entrepreneurial skills required for success in the era of IR4.0. By conducting in-depth interviews and focus group discussions with entrepreneurs

actively engaged in IR4.0-related ventures, we intend to offer a nuanced understanding of the skills that have gained prominence in this digital age.

With the help of IR4.0's trends and difficulties, a new form of entrepreneurship through this research by specifically looking at the essential traits and elements of new entrepreneurial skills that can make use of cutting-edge technologies and handle the problems of the digital age. This research is performed to advance both theoretical and practical knowledge of entrepreneurship in the IR4.0 age. Therefore, understanding the skills required for entrepreneurs to succeed in this era is crucial for promoting innovation, growth, and competitiveness in the business world.

1.3 Problem Statement

There is a growing need for entrepreneurs to possess the skills necessary to navigate the complex landscape of IR4.0 and capitalize on its potential benefits. However, research on the specific entrepreneurial skills required to thrive in this new industrial era remains limited. IR4.0 has fundamentally transformed business operations and competition with the advent of technologies such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain. These technologies present new opportunities and challenges for entrepreneurs, demanding a unique skill set that differs from those required in previous industrial revolutions (Dorrenbacher and Gann, 2020).

Current entrepreneurial paradigms may no longer suffice in the era of IR4.0. Traditional models, created for a different time, often fail to address the emerging issues and trends of the digital age (Mathews and Tan, 2020). Despite increased awareness of the potential of technologies like AI and blockchain, a coherent framework for integrating these technologies into entrepreneurship is lacking (Zhou and Li, 2019). Although the necessity for new skills and mindsets is widely recognized, there remains a need for a comprehensive understanding of what these skills and mindsets entail (World Economic Forum, 2018).

Malaysian businesses, particularly SMEs, face significant challenges in technology utilization and innovation capability, both of which are crucial for thriving in the IR4.0 era. While innovation capability has been shown to positively impact SME performance, with technology adoption playing a mediating role (Jalil et al., 2021), many local entrepreneurs are

hesitant to leverage technology for business development (Rahman and Shariff, 2020). Additionally, small and medium manufacturers in Malaysia struggle to enhance their technological capabilities within the Industry 4.0 context (Azman and Ahmad, 2020). This struggle is exacerbated by a limited understanding of Industry 4.0 concepts and practices among manufacturers (Ling et al., 2020), coupled with a shortage of knowledgeable and skilled workers capable of handling Industry 4.0 technologies (Ratnasingam et al., 2020).

As the Fourth Industrial Revolution ushers in radical technological changes, there is a pressing need to prepare the workforce, including entrepreneurs, with a blend of skills to meet future demands (Rodzalan et al., 2022). The lack of knowledgeable and skilled entrepreneurs remains a major obstacle for the Malaysian industry in adopting Industry 4.0 technologies. In response, the Malaysian government has introduced policies such as the MyDIGITAL blueprint to drive the nation's digital economy forward and align with IR4.0 goals, emphasizing the need for a skilled workforce capable of leveraging new technologies (Khan et al., 2021). However, a significant theoretical gap persists in understanding the specific entrepreneurial skills required to effectively implement these policies and ensure Malaysia's competitiveness in the global market (Kruger and Steyn, 2020). Current theories on entrepreneurial skills and IR4.0 do not fully address the unique challenges and opportunities faced by Malaysian entrepreneurs, particularly in integrating advanced technologies like AI, IoT, and blockchain into their ventures. This gap in both theory and practice, evident in both Malaysia and the broader international context, highlights the critical need for refined the existing models or theories and a more comprehensive understanding of the skills necessary for entrepreneurial success in IR4.0.

There is also a lack of research and understanding regarding the specific skills required by entrepreneurs to succeed in this context (Radu and Radu, 2020; Tang and Tan, 2019). By identifying the skills necessary for entrepreneurs in the IR4.0 era, this study aims to inform strategies that support entrepreneurship in this dynamic and rapidly changing business environment. In turn, this can foster innovation, growth, and job creation in the context of IR4.0. Therefore, this study seeks to identify the requisite entrepreneurial skills required for IR4.0 through a qualitative analysis of insights from key Industry 4.0 players, including entrepreneurs, industrial leaders, executives, government agencies, and IR4.0 auditors.

1.4 Research Questions

This study seeks to answer the following research questions:

1. What are the challenges faced by entrepreneurs operating in the context of IR4.0?
2. What are the requisite entrepreneurial skills required for IR4.0?
3. How can entrepreneurs overcome the challenges in IR4.0 and leverage their entrepreneurial skills effectively?

1.5 Research Objectives

These objectives aim to provide a comprehensive understanding of requisite entrepreneurial skills, the factors affecting the development of these requisite entrepreneurial skills, and the challenges faced by entrepreneurs in IR4.0. By achieving these objectives, the study aims to contribute to the theoretical and practical understanding of entrepreneurship in the era of IR4.0. The objectives of this study are:

1. To explore and analyze the challenges faced by entrepreneurs operating in the context of IR4.0.
2. To identify and examine the requisite entrepreneurial skills required for success in IR4.0.
3. To investigate effective strategies and approaches for entrepreneurs to overcome the challenges in IR4.0 and leverage their entrepreneurial skills effectively.

1.6 Significance of the Study

This study contributes to the existing body of knowledge on entrepreneurship and IR4.0 by identifying the specific skills required for entrepreneurs to succeed in this new industrial era, with a particular focus on the Malaysian context. Understanding these skills is crucial for entrepreneurs to evaluate their own abilities, pinpoint areas for improvement, and strategically acquire or develop the skills needed to successfully navigate the challenging and rapidly evolving IR4.0 environment. This knowledge enhances their capacity to seize opportunities, promote innovation, and achieve sustainable growth in the digital age.

The findings of this study can be used to inform entrepreneurship education programs and policy initiatives aimed at supporting entrepreneurs in IR4.0, particularly within Malaysia. By tailoring these programs to the unique needs and challenges faced by Malaysian

entrepreneurs, educators and policymakers can enhance the effectiveness of their efforts to cultivate a robust entrepreneurial ecosystem in the country.

Specifically, this study's results can assist stakeholders such as entrepreneurship support organizations, industry associations, and business incubators in Malaysia to develop programs and services that effectively address the skill gaps and developmental requirements of entrepreneurs. This may involve providing access to resources, networking opportunities, mentoring programs, and other initiatives that improve the requisite entrepreneurial skills necessary for success in the digital age.

Industry leaders in Malaysia can gain valuable insights from this study about the vital abilities and skills that fuel entrepreneurial success in IR4.0. By understanding the specific capabilities needed to leverage emerging technologies, adapt to change, and seize market opportunities, industry leaders can align their strategies, operations, and talent development initiatives to promote an entrepreneurial mindset within their organizations. This alignment can boost innovation, competitiveness, and the ability of Malaysian industry leaders to effectively address the challenges and disruptions posed by IR4.0.

Furthermore, the study's findings can help Malaysian policymakers design supportive policies and programs that enable entrepreneurs to acquire the necessary skills for IR4.0. Additionally, educators can use the study's results to develop entrepreneurship education curricula that address the specific needs of entrepreneurs in IR4.0, ensuring that graduates are better prepared to contribute to the nation's economic growth and innovation landscape.

Finally, the study has broader implications for societal issues related to the future of work and inclusive growth in Malaysia. By exploring the potential of entrepreneurship to address societal challenges and promote inclusive growth, the study can contribute to the ongoing debate on the role of entrepreneurship in the digital age, highlighting how targeted efforts in Malaysia can drive national development and inclusive economic progress. Addressing these research gaps is crucial for advancing knowledge, informing practice, and addressing practical problems in the field, ultimately contributing to the nation's readiness for IR4.0 and beyond.

1.7 Operational Definitions

- **Fourth Industrial Revolution (IR4.0):** The Fourth Industrial Revolution refers to the ongoing transformation of industries through the integration of advanced technologies such as artificial intelligence, big data analytics, automation, and the Internet of Things (IoT). This revolution is characterized by a fusion of digital, physical, and biological systems, leading to unprecedented changes in how industries operate and interact with each other and society.
- **Requisite Entrepreneurial Skills:** The term "requisite" refers to something that is necessary or required for a particular purpose or to achieve a specific outcome. In the context, "requisite entrepreneurial skills" means the essential skills and competencies that are necessary for successful entrepreneurship, particularly within the framework of the Fourth Industrial Revolution. These skills include, but are not limited to, technological proficiency, innovation, problem-solving, strategic thinking, adaptability, and resource management.
- **Industry 4.0 Players:** Industry 4.0 players are organizations, companies, and individuals actively involved in the development, implementation, and utilization of Fourth Industrial Revolution technologies. These players include technology developers, manufacturers, service providers, and other stakeholders who contribute to the advancement and adoption of Industry 4.0 innovations.
- **Entrepreneur:** An entrepreneur is an individual who identifies opportunities, takes risks, and innovatively mobilizes resources to create and grow a business. Entrepreneurs are characterized by their ability to drive economic growth and adapt to changing market conditions, particularly in the context of technological advancements and Industry 4.0.
- **Industry Leaders:** Industry leaders are prominent and influential individuals or organizations within a specific industry. They are recognized for their expertise, achievements, and ability to shape industry trends and standards. Industry leaders play a critical role in guiding the direction of industry development, particularly in the adoption and integration of Fourth Industrial Revolution technologies.
- **Senior Executives:** Senior executives are high-ranking officials within an organization who are responsible for making strategic decisions and overseeing the overall operations