

Refining Interview Protocol for Implementing Digital Entrepreneurship Education in Polytechnic's Business Incubation Program

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Abstract

Integrating digital entrepreneurship education into business incubation programs is crucial for preparing students for the digital economy. Malaysian polytechnics have adopted these initiatives, but implementation varies widely across institutions. To address these inconsistencies, a structured interview protocol is needed for consistent and comprehensive data collection. This article employs the Institutional Isomorphism Theory (DiMaggio and Powell, 1983), Student Encouragement Entrepreneurship Incubation Model (Jansen et al., 2015), and New Venture Creation Theory (Gartner, 1985) as its theoretical foundation. It introduces the Semi-Structured Interview Protocol Development (SIPD) Framework from Castillo-Montoya (2016), which involves a four-phase process to refine interview protocols. The four phases involve: (1) aligning with research questions, (2) constructing an inquiry-based conversation, (3) receiving feedback on interview protocols, and (4) piloting the interview protocol. The SIPD Framework addresses entrepreneurial motivations, incubator management strategies, and pedagogical approaches in digital entrepreneurship education within Malaysian polytechnics' business incubation programs. By systematically refining the interview protocol, the framework ensures detailed and trustworthy data collection for multiple case studies. This framework can be instrumental for other policy makers, educators, and organizations aiming to standardize and enhance digital business education in higher education, particularly in technical and vocational education (TVET).

Keywords: Digital Entrepreneurship, Entrepreneurship Education, Business Incubator, Industry 4.0, TVET, Interview Protocol

Introduction

The Fourth Industrial Revolution (4IR) explores emerging digital technologies like the Internet of Things, cloud computing, artificial intelligence, and augmented reality, integrating them across various economic sectors (World Economic Forum, 2020). The COVID-19 pandemic accelerated the adoption of digital technology as sectors restructured their workforces

(Legese Feyisa, 2020; Okwori et al., 2021). This shift has created opportunities for entrepreneurs to innovate, transforming business models and fostering "digital entrepreneurship" (Kraus et al., 2019). As defined by the World Bank Group (2016), digital entrepreneurship involves digitally transforming new or existing businesses, products, or services and its implementation has prompted significant policy shifts to promote business digitalization among entrepreneurs (Kalolo, 2019).

Consequently, the impact of the Fourth Industrial Revolution (4IR) is driving demand for new digital entrepreneurship education initiatives within Technical and Vocational Education and Training (TVET) (Halabisky, 2019). UNESCO's focus on TVET to produce skilled student entrepreneurs is crucial for meeting business digitization needs (ILO-UNESCO, 2020). As the demand for entrepreneurial digital competencies grows, experts emphasize the importance of business incubators in accelerating digital technology adoption among student entrepreneurs (Grimaldi and Grandi, 2005; Yamockul et al., 2019). Business incubation programs provide structured entrepreneurship training, offering flexible workspaces and shared infrastructure to enhance entrepreneurs' potential and refine their business skills (Hackett and Dilts, 2004; Mian et al., 2016; UBI Global, 2019).

Research on business incubation programs has predominantly focused on countries like the United States, the United Kingdom, China, and Spain (Bergek and Norrman, 2008; Jansen et al., 2015; Dalmarco et al., 2018; McAdam et al., 2016; Tang et al., 2019). Yunos (2002) noted that developing countries often emulate practices from developed nations when establishing their own incubation programs. Due to this, UNESCO (2018) emphasizes the urgency for TVET systems to adapt through business incubation programs, ensuring that digital entrepreneurship education equips students with the skills needed for a new era of human-machine collaboration. Given the challenges highlighted by the Malaysian Ministry of Higher Education (2022) regarding the low entrepreneurship rate among polytechnic graduates at just 9.5 per cent in 2021 and the varying implementation of business incubation programs across Malaysian polytechnics, there exists a compelling need for comprehensive data collection in regard to the program implementation. This necessitates a multiple case study approach to explore how different polytechnics are addressing the mandates of the TVET 4.0 Framework and addressing challenges outlined in the Industry4WRD National Policy (Malaysian Ministry of Education, 2018; Malaysian Ministry of International Trade and Industry, 2018).

By exploring and refining interview protocols as the data collection of a multiple case study tailored to the implementation of digital entrepreneurship education in polytechnic business incubation programs, this research aims to provide detailed insights that can inform policy and practice regarding business digitalization strategies and areas for improvement within the TVET sector. Understanding how different polytechnics approach these initiatives not only supports the enhancement of educational programs but also contributes to the broader discourse on fostering innovation and digital entrepreneurship among young graduates. Ultimately, this study seeks to benefit policymakers, educators, and stakeholders in TVET particularly the Malaysian Ministry of Higher Education and Department of Polytechnic Education and Community College Education by facilitating the development of effective blueprint for business digitalization that align educational outcomes with industry demands. This can lead to the development of targeted policies and practical guidelines for other educational institutions looking to adopt similar initiatives in supporting the growth of digital skills and entrepreneurship among young graduates.

Implementing Digital Entrepreneurship Education in Malaysian Polytechnics' Business Incubation Program

Aligned with Malaysian 4IR educational policy (Ministry of Education Malaysia, 2018), the Entrepreneurship Development for Polytechnic and Community College (CEDev) plays a crucial role in implementing digital entrepreneurship education through business incubation programs. CEDev introduced the Standard Operating Handbook for Entrepreneurship Incubator of Malaysian Polytechnic and Community College Polytechnic and Community College Education Department (2021), offering a business incubation model tailored to Malaysian polytechnics. Despite government efforts to promote digital entrepreneurship in higher education, there remains limited understanding of the motivations driving students to initiate digital ventures (Ooi and Ahmad, 2012).

Abbas and Ahmad Sabri (2022) identified several motivating factors for Malaysian student entrepreneurs to engage in digital businesses, including improving life quality, enjoying flexible working hours, increasing income, assuming leadership roles, and a strong passion for business digitalization. Beyond institutional support, Mamat et al (2023) noted that motivations extend beyond institutional support to encompass personal development, gaining recognition, and support from family and friends. found that student entrepreneurs are drawn to business digitalization because they believe digital platforms can enhance their performance, despite the significant influence of risk and trust on adopting digital entrepreneurship. However, Din et al (2020) argued that emphasizing a teacher-centric approach and strong foundational relationships with students is insufficient for fostering entrepreneurial motivation within Malaysian higher education institutions.

In this case, Ho and Turner (2019) advocated for a shift in educators' mindsets to better prepare student entrepreneurs for the challenges of entrepreneurship, particularly in the digital age where adaptability and innovation are essential. Given that research results from Western countries might not be applicable in Malaysia, where teacher-centered education is the norm and teachers' authority is highly respected Ismail et al (2018), exploring entrepreneurial motivation in this context is essential. To achieve this, a comprehensive and methodical inquiry is needed to systematically capture the factors influencing entrepreneurial motivation. This structured approach will help researchers understand what motivates student entrepreneurs and Malaysian educators, such as entrepreneurship mentors or managers, to engage in entrepreneurial ventures underlying their success (Ooi and Ahmad, 2012; Nawil et al., 2019; Abbas and Ahmad Sabri, 2022; Vejayaratnam et al., 2019). Despite the growing recognition of the importance of entrepreneurship mentorship within university settings Rippa and Secundo (2019); Primahendra et al (2021); Gunaseelan et al (2022), research regarding entrepreneurial motivation has predominantly focused on quantitative methods and there is a need to gain deeper insights regarding the factors that drive entrepreneurial motivation towards digital entrepreneurship within business incubation programs in TVET sectors.

Jamil et al (2016) highlighted the landscape of digital entrepreneurship education within business incubation programs, paralleling Malaysia's trajectory in technology-based initiatives. However, Khalid et al (2014) described the evolution of pedagogical approaches for business digitalization in these programs, covering technical development, entrepreneur grooming, business establishment, commercialization strategies, and market expansion. In regard to this, Sufian (2006) emphasized leveraging Malaysian higher education institutions to create new entrepreneurs by harnessing institutional expertise. However, Ruslan (2018) that most studies in Malaysia are descriptive and focus on selected business incubators to

enhance understanding of those specific programs. Furthermore, the current business incubation model provided by CEDev Polytechnic and Community College Education Department (2021) lacks the necessary emphasis on pedagogical approaches and management strategies tailored to nurture digital entrepreneurship.

There is also a noticeable research gap regarding the educational setting of Malaysian business incubator programs Yunos (2002); Sufian (2006); Khalid et al (2012); Nasir et al 2017; Ruslan (2018) despite extensive research on university-based business incubator programs in developed nations (Bergek and Norrman, 2008; Jansen et al., 2015; Pauwels et al., 2016; Dalmarco et al., 2018; Korejo, 2023). A structured data collection approach is essential to effectively capture insights into how resources and support services are utilized, the enhancement of mentorship, the creation of reliable networks, and the facilitation of access to business capital, and other necessary aspects particularly in TVET institutions such as polytechnics. Understanding these crucial components, especially concerning the success and sustainability of business incubation programs within the context of digital entrepreneurship education, will contribute to developing proper guidelines for higher education institutions aiming to foster product innovation and student entrepreneurial growth.

Theoretical Framework

To guide this qualitative research based on the research questions, the study adopted the Student Entrepreneurship Encouragement Model Jansen et al (2015), Institutional Isomorphism Theory DiMaggio and Powell (1983), and New Venture Creation Theory Gartner (1985) as its theoretical framework. The Institutional Isomorphism Theory DiMaggio and Powell (1983) illuminates how external pressures, such as government initiatives promoting digital entrepreneurship education and incubation programs, influence the motivations of various stakeholders, including student entrepreneurs, mentors, and incubator managers within Malaysian polytechnics. These government initiatives exert isomorphic pressure on polytechnic management to adopt and promote digital entrepreneurship education and incubation programs. Gartner's New Venture Creation Theory (1985) highlights the multifaceted nature of entrepreneurship, considering individual, environmental, organizational, and process-related factors that impact entrepreneurs in establishing new ventures. By incorporating Gartner's theory in this study's context, the study aims to understand the interconnected dimensions that influence the effectiveness of digital entrepreneurship education within the polytechnic setting.

As for the Student Entrepreneurship Encouragement Model Jansen et al (2015), the model serves as a framework to assist this study in comprehending the multiple stages and strategies necessary to promote entrepreneurship education among students who venture into businesses. The incubation stage in the model suggested by Jansen et al (2015) also highlighted regarding the provide tangible and intangible support in order to facilitate the development of university-based businesses. Yin (2018) pointed out that theoretical frameworks can be analytically generalized by modifying, rejecting, advancing existing concepts, or introducing new ones based on study findings. Thus, the theoretical framework adopted in this research establishes a robust basis for comprehending the intricate dynamics at play, guiding the exploration of key aspects aligned with the research questions and ensuring systematic gathering of insights across cases. To effectively collect data for this multiple case study, the research seeks to address the following research questions:

- a) What are the entrepreneurial motivations of student entrepreneurs, entrepreneurship mentors, and incubator managers to involve in digital entrepreneurship within business incubation program at Malaysian polytechnics?
- b) How do incubator management strategies facilitate the implementation of digital entrepreneurship within Malaysian polytechnics' business incubation program?
- c) How do the pedagogical approaches of digital entrepreneurship education is being implemented within Malaysian polytechnics' business incubation program?

Research Design (Multiple Case Study)

This study employs a qualitative research methodology not for generalization but to uncover the significance of the specific case. Thus, the objective is to expand and provide analytical reasoning on chosen theories and models within the Malaysian context. In designing this research, the case study approach aligns well with the research questions. Drawing inspiration from scholars like Merriam (2010); Cohen et al (2018), the choice of a case study is justified as it explores real-life situations within the bounded system of Malaysian polytechnics' business incubation programs. Stake (2006) supports the case study's primary focus, which can represent various entities, such as individuals, groups, programs, institutions, or specific policies. Consequently, the characteristics of starting with specific cases, outlining a bounded system, and focusing on identifying case themes align with the research objectives of this qualitative study.

The unit of analysis in the case study is the business incubation program itself, allowing for a detailed examination of its intricacies. Considering the various types of case studies including the single instrumental case study, multiple or collective case study, and intrinsic case study as suggested by Yin (2016), the researchers have chosen a multiple case study design, selecting two business incubation programs—Eduvalley Polytechnic and Skillrise Eastside Polytech—to provide diverse perspectives on the research issues. By adopting this approach, the research aims to gain insights into stakeholders' entrepreneurial motivations, pedagogical approaches, and incubator management strategies. This comparative analysis is crucial for developing a robust interview protocol that captures the diverse perspectives and contextual nuances within Malaysian polytechnics.

Location of the Study

When conducting case study research, it is essential for researchers to thoughtfully decide on the specific elements to include in the study, such as events, programs, activities, individuals, and processes. This ensures that during the analysis across cases, the researcher can effectively define the key themes of each case (Creswell and Poth, 2018). As a result, this study focuses on the business incubation program within the entrepreneurship unit at two polytechnics in Malaysia: Eduvalley Polytechnic and Skillrise Eastside Polytech. Both polytechnics were given pseudonyms to ensure that their identities remain confidential, protecting the privacy of the institutions, their staff, and their students. This measure was taken to maintain anonymity, allowing for honest and unbiased responses during data collection. These polytechnics were selected using purposeful sampling for this multiple case study research, as they met the inclusion criteria. This approach with Merriam and Tisdell (2016); Yin (2018), as it allows for a comprehensive understanding of the research topic without seeking statistical generalization by employing a small sample size of no more than four or five participants. The selection criteria for each Malaysian polytechnic in these multiple case studies are outlined below:

- a) The business incubation program must involve student entrepreneurs from various departments in polytechnics, such as engineering, agrotechnology, accounting, or information technology.
- b) The business incubation program should offer services and facilities for student entrepreneurs, including research laboratories, machinery, workspace, entrepreneurial networks, digital entrepreneurship courses, mentorship, or financial support
- c) The program should utilize digital tools, digital marketing, digital platforms, or technological solutions to enhance digitalization in business incubators at Malaysian polytechnics.

Research Sampling of the Study

The researchers have utilized non-probability sampling as a pivotal step in identifying participants, gaining entry, and fostering rapport with individuals from selected polytechnics for this qualitative study. Consistent with Marshall and Rossman (2015), the sampling methods are adaptable and can be adjusted during qualitative research. However, preparatory work is crucial for the researcher to ensure specific guidelines are established during the initial data collection phase. Thus, the researchers' integrated approach involves strategizing the selection of specific locations and research participants for purposeful sampling. In addition to justifying sampling strategies and sample size, this research adheres to Creswell's (2018) recommendation to define criteria for research participants, serving as the sampling frame to identify a specific group from which participants are chosen. Consequently, the inclusion criteria for selecting research participants are outlined as follows, aiming to set clear boundaries and define a specific scope of study encompassing individuals capable of offering valuable perspectives on the research topic.

- a) **Student entrepreneurs** are apprentices who operate businesses benefiting from digital tools, marketing, platforms, or technological solutions to enhance operations. In line with the Incubator Implementation Guideline developed by the Malaysian Polytechnic Entrepreneurship Center (2014) which allows student entrepreneurs to engage in the incubation program from their first semester through their fourth semester, this study has included student entrepreneurs who enrolled into business incubation program at any Malaysian polytechnic for a minimum duration of one semester. To ensure a baseline level of entrepreneurial knowledge, participants must have completed a minimum of two credit hours in entrepreneurship subject as proposed by the (Malaysian Ministry of Higher Education, 2021).
- b) The **entrepreneurship mentors** must be lecturers in Malaysian polytechnics actively involved in training or advising in business incubation programs. In alignment with the Operating Handbook for the Entrepreneurship Incubator of Malaysian Polytechnic and Community College developed by the Polytechnic and Community College Education Department (2021), criteria include significant experience in teaching entrepreneurship subjects and a strong commitment to entrepreneurial activities. Thus, this study selects mentors with a minimum of two years of teaching experience as recommended in the Malaysian Polytechnic Entrepreneurship Center (2014) to provide practical insights into the research topic.
- c) As for **incubator managers**, the individual should be officers or lecturers in charge of business incubation programs with over two years' experience working in Malaysian polytechnics. They should be actively involved in implementing digital entrepreneurship

for student entrepreneurs. The two-year threshold indicates familiarity with contemporary practices relevant to digital entrepreneurship.

The study focuses on two purposeful sampling strategies—heterogeneous and snowball sampling—tailored based on the suitability of identifying research participants in selected polytechnics. Heterogeneous sampling is prioritized to capture diverse viewpoints within the incubation program. Following semi-structured interviews with incubator managers, snowball sampling is employed to engage entrepreneurship mentors and student entrepreneurs through referrals, ensuring cooperation and suitability for the study. This method enhances data collection by recruiting subjects aligned with inclusion criteria, with primary research participants suggesting others to address research questions.

Semi-Structured Interview Protocol Development Framework

The primary data collection that has been utilized by the researchers to explore the implementation of digital entrepreneurship education in business incubation program at Malaysian polytechnics is semi-structured interviews with selected participants. Thus, this multiple case study has comprised four-phase process to fine-tune semi-structured interview protocols and gather the research data related to this study adapted from Castillo-Montoya (2016)'s approach, including *1) aligning with research questions, (2) constructing an inquiry-based conversation, (3) receiving feedback on interview protocols, and (4) piloting the interview protocol*. Each phase helps the researchers take one step further toward developing an interview protocol appropriate for their participants and congruent with the aims of the research (Jones et al., 2013). By combining these phases as indicated in Figure 1, it will offer a systematic procedure for developing a well-vetted interview protocol that can help the researchers in obtaining robust interview data necessary to address research questions of this study.

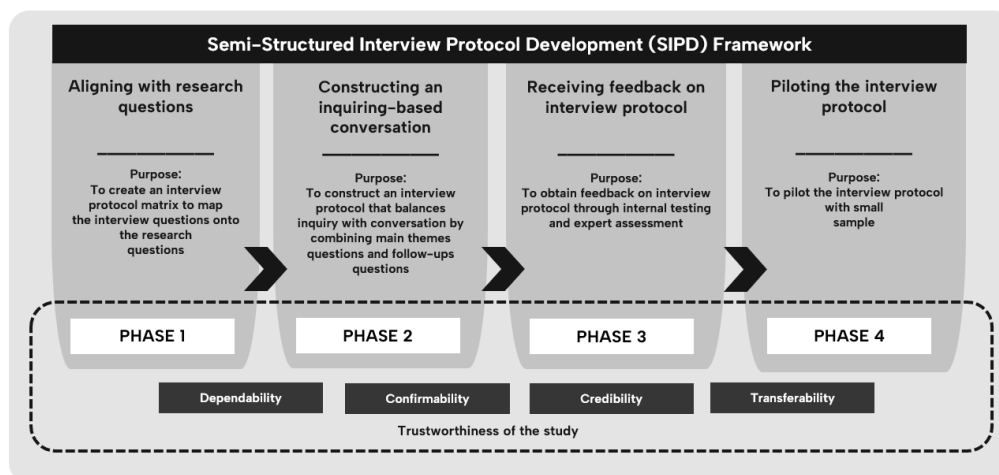


Figure 1: Semi-Structured Interview Protocol Development (SIPD) Framework of this study (Source: Adapted from Castillo-Montaya, 2006, p. 828)

Phase 1: Aligning with Research Questions

The researcher initiated the development of the SIPD framework by developing a semi-structured interview protocol comprising unbiased, clearly articulated, single-faceted, and open-ended questions. The aim is to allow participants to express their viewpoints, emotions, and perceptions freely, devoid of predetermined responses. This approach aligns with Merriam and Tisdell's (2016) recommendation, emphasizing the need for flexible questioning

to explore diverse issues and elicit spontaneous responses. Since the researchers serve as the primary instrument in this study, a commitment was maintained to stay focused on the research purpose and questions, adhering to Cohen, Manion, and Morrison's (2018) guidance to enhance data collection effectiveness through semi-structured interviews. An example of a semi-structured interview protocol matrix in Table 1 illustrates how the interview questions were aligned with the research questions to identify any potential gaps and ensure coherence with the study's objectives. During this phase, this iterative process allows for assessment and adjustment or addition of interview questions to maintain balance across research inquiries (Castillo-Montoya, 2016). In summary, phase 1 focuses on the researchers developing an interview protocol aligned with the study's purpose.

Table 1

Semi-structured Interview Protocol Matrix

	Background Information	Research Question 1 (Entrepreneurial Motivations)	Research Question 2 (Incubator Management Strategies)	Research Question 3 (Pedagogical Approaches)
Interview Q1	X			
Interview Q2	X			
Interview Q3		X		
Interview Q4		X		
Interview Q5		X		
Interview Q6		X		
Interview Q7		X	X	
Interview Q8		X	X	
Interview Q9		X	X	
Interview Q10			X	
Interview Q11			X	
Interview Q12			X	
Interview Q13			X	
Interview Q14			X	

Interview Q15		X	
Interview Q16		X	
Interview Q17		X	
Interview Q18	X		X
Interview Q19	X		X
Interview Q20	X		X
Interview Q21			X
Interview Q22			X
Interview Q23			X
Interview Q24			X
Interview Q25			X

Phase 2: Constructing an Inquiry-Based Conversation

A semi-structured interview protocol should incorporate two tiers of questioning including main themes and follow-up questions (Kallio et al., 2016). Following Castillo-Montoya (2016), Phase 2 involves developing an inquiry-based conversation through an interview protocol featuring: a) questions distinct from the research questions; b) a conversational structure adhering to social norms; c) a diverse range of questions; d) a script with anticipated follow-up and prompt questions. The main theme within this study revolved around the core aspects of the research topic, encouraging participants to openly discuss their involvement in Malaysian polytechnics' business incubation program. By methodically arranging these themes and ensuring logical progression, researchers facilitated a smooth and comfortable dialogue, prompting participants to share their experiences candidly. These main themes delved into familiar yet pivotal issues, ensuring the discussions remained relevant and insightful.

The inclusion of follow-up questions, as stressed by Turner (2010), played a crucial role in sustaining conversation flow and eliciting comprehensive, precise insights. These questions not only elaborated on specific points raised but also unveiled underlying issues and nuances. Spontaneous follow-up questions, as recommended by Whiting (2008), proved particularly effective. Through verbal techniques like rephrasing participants' statements, expressing interest through verbal affirmations, and demonstrating awareness of pertinent information, interviewers fostered a more dynamic and responsive dialogue, extracting additional insights regarding the implementation of digital entrepreneurship education in Malaysian polytechnics' business incubation program. This particular phase underscored the importance of encouraging for an effective communication and interaction between interviewers and participants in this study. Integrating structured main themes with

adaptable follow-up questions, whether pre-planned or spontaneous, was pivotal in capturing the richness of research participants' experiences and ensuring the quality of collected data throughout this multiple case study research. Table 2 illustrates an example of transitional semi-structured interview questions for the third research question related to pedagogical approaches to implement digital entrepreneurship education in Malaysian polytechnic's business incubation program, employing an inquiry-based conversation approach as advocated by (Castillo-Montoya, 2016, p. 823).

Table 2

Semi-structured Interview Protocol Matrix

Type of Question	Type of Question Examples
Introductory Question (Questions that prompt the disclosure of general information)	<i>Could you explain how students developed their understanding of digitalization?</i>
Transition Question (Questions that link the introductory questions to the key questions to be asked)	<i>How do student entrepreneurs get entrepreneurial training related to digital entrepreneurship?</i>
Key Question (Questions that are most related to the research questions)	<i>How would you describe the teaching and learning approach used in this business incubation program?</i>
Follow-up Questions (Subsequent related questions to prompt the key questions)	<i>How do you help student entrepreneurs apply their digital knowledge gained to real-world digital business scenarios?</i> <i>How do you involve industry experts or professionals in the digital entrepreneurship education process in this business incubation program?</i>
Closing Question (Questions that are straightforward to offer for closure)	<i>Before we conclude this interview, is there something about your experience related to the implementation of digital entrepreneurship education in business incubation program that we have not yet had a chance to discuss?</i>

Phase 3: Receiving Feedback on the Interview Protocol

Seeking feedback on the interview protocol is essential to ensure its reliability as a research tool in this study. Feedback provides valuable insights into participants' understanding of the questions and helps align them with the researcher's intentions (Patton, 2015). Therefore, two distinct techniques have been employed to validate the interview protocol, as outlined by Kallio et al (2016, p. 14) including: *internal testing and expert assessment*. In accordance with Hurst et al (2015), the process of receiving feedback on the interview protocol based on multiple techniques aligns with the iterative nature of qualitative research whereby the researchers actively seeking feedback through various methods, attentively listening, and continuously refining the interviews to better capture participants' experiences and extract relevant information for the study.

Internal Testing. This first technique in validating the interview protocol of this study involves internal testing, a method proven effective in conducting a thorough assessment of the

preliminary interview protocol (Kallio et al., 2016). This internal testing adheres to Castillo-Montoya's (2016, p. 826) suggestion, emphasizing the importance of a close examination with research team members in qualitative research to scrutinize the interview protocol's structure, length, writing style, and to prevent the inclusion of inappropriate leading questions. As further stressed by Maxwell (2013), the researcher should encourage those performing the close reading to adopt the perspective of research participants as this practice aims to foresee how they might interpret and answer the questions during the interview sessions. In this study, the supervisory committee members, who are also part of the research team, have contributed to this critical evaluation. During internal testing, the researchers focused on gathering significant insights from the research team regarding the relevance of the interview questions to the research objectives, ensuring they were clear, concise, and devoid of academic jargon, as advised by (Castillo-Montoya, 2016).

Expert assessment. Although several qualitative scholars argue that expert assessment is unnecessary when pilot testing has been conducted in qualitative studies Merriam and Tisdell (2016); Yin (2016); Creswell and Poth (2018), the researchers has opted to integrate the additional technique for obtaining feedback as proposed by Kallio et al. (2016, p. 15). This technique, known as expert assessment, involves evaluating the appropriateness and comprehensiveness of the interview protocol content concerning the study's objectives and subjects before pilot testing. According to Kallio et al (2016), there is no specific requirement for recruiting specialists for expert assessment; rather, the goal is to subject the preliminary interview protocol to critique by an external specialist not part of the research team. This process facilitates discussions aimed at providing valuable guidance regarding the wording and arrangement of the questions. The suggestions and comments from the specialist selected by the researchers for this study were duly acknowledged and incorporated to further refine the interview protocol before commencing the pilot testing.

Phase 4: Piloting the Interview Protocol

This pilot study that has been highly recommended by prominent scholars Merriam and Tisdell (2016); Creswell and Poth (2017) was carried out at Northwood Polytechnic to verify the interview protocol revised by the researchers through internal testing and expert assessment. Conducted prior to the main study, this pilot test aimed to replicate the semi-structured interview under realistic conditions and gauge its duration accurately. Following Yin's (2018) guidance, this method ensures the refinement of the interview protocol, restructuring of questions, and evaluation of question appropriateness for research participants after internal testing and expert assessment. Participants chosen for the pilot testing of this study exhibit similar characteristics to those anticipated in the actual study. This alignment follows Maxwell (2013) suggesting that pilot participants should mirror the traits intended for actual interview to test the research procedures, instruments, and methodologies, thereby enhancing the overall trustworthiness of the research findings. Four participants, including an incubator manager, two entrepreneurship mentors, and a student entrepreneur, underwent similar interviews conducted by the researchers using the revised protocol. These interviews, conducted both in person and online via Microsoft Teams, lasted over 90 minutes, with all participants displaying full commitment throughout the process. The pilot testing has provided valuable experience in conducting semi-structured interviews and has familiarized the researchers with the essential skills needed to maintain a smooth flow of conversation with participants. It has also become evident that establishing a good rapport with the gatekeeper is crucial for facilitating the data collection, as was observed

during the pilot testing. The gatekeeper, also the head of the entrepreneurship unit at Northwood Polytechnic, displayed unwavering commitment in providing pertinent information and documents, significantly aiding the researchers' progress. This laid a sturdy groundwork, delineating necessary procedures and instilling confidence for the forthcoming study. Subsequent to pilot testing completion, the researchers had the chance to refine the interview protocol and discern requisite strategies before embarking on the actual study phase. Importantly, the insights gleaned from pilot testing could be reworked to offer more practical guidance, assisting the researchers in reviewing and learning from any errors, thus ensuring a smoother data collection process during the main study.

Discussion

In this study, the researchers have adapted Castillo-Montoya (2016)'s approach for creating the Semi-Structured Interview Protocols Development (SIPD) framework to ensure data related to this research topic could be collected within the allocated time and effectively capture participants' experiences. The findings indicated that the interrelated phases of the SIPD framework including aligning with research questions, constructing inquiry-based conversations, receiving feedback on interview protocols, and piloting the interview protocol are inseparable, as each phase supports the preparation and success of the next. The process begins with a critical examination of whether the research questions can be addressed through semi-structured interviews during the first phase of SIPD framework. By visually aligning the interview questions with the research questions using a protocol matrix, the researchers can ensure comprehensive coverage of the research inquiry. This alignment also helps identify redundancies that may require additional probing.

The researchers then proceeded to the second phase of SIPD framework once the prerequisites of using the method were achieved by utilizing the previous knowledge from the literature review and theoretical framework as a basis for formulating the semi-structured interview protocol in this study's context. This phase played a crucial role in eliciting nuanced insights into participants' experiences and perspectives. By employing verbal techniques, the researchers facilitated responsive dialogue, ensuring participants felt valued and understood. This approach enabled the extraction of deeper insights into entrepreneurial motivations, incubator management strategies, and pedagogical approaches within Malaysian polytechnics' business incubation programs. Ethical considerations were paramount during this phase, with the researchers ensuring interview questions did not cause harm to participants. By integrating structured main themes with adaptable follow-up questions, whether pre-planned or spontaneous, researchers were able to capture the richness of the participants' experiences. This methodological rigor enhanced the quality of the data collected, significantly contributing to the success of the multiple case study research.

During the third phase of the SIPD framework, the researchers subjected the initial semi-structured interview protocol to critical evaluation to determine if adjustments were necessary. The researchers employed the dual approach which is internal testing and expert assessment to emphasize the iterative nature of qualitative research, wherein researchers actively seek, heed, and integrate feedback to continually enhance their data collection methods. Findings revealed that internal testing with the research team enabled scrutiny of the interview protocol's structure, length, and language to mitigate biases like leading questions. Furthermore, external input from specialists selected for this study during the expert assessment facilitated impartial evaluation of the interview protocol's content, ensuring alignment with the study's aims and subjects. The specialists' feedback provided

valuable insights into question wording and arrangement, which the researchers acknowledged and incorporated into the protocol, refining the interview questions to better capture essential study data.

In the final phase of SIPD framework, the pilot test effectively replicates the conditions of actual semi-structured interviews, enabling researchers to evaluate the protocol's effectiveness and duration. Before conducting the pilot test, the researchers prioritize ethical considerations by developing an informed consent form for research participants. This form outlines the research objectives, the researcher's expectations, the potential risks and benefits of participation, and the criteria for participant eligibility. Throughout the pilot testing phase, the researchers emphasize the importance of building trust and rapport with participants, maintaining transparency, honesty, and avoiding any potential deception. This approach not only tests the interview protocol in varied settings but also underscores the significance of flexibility and adaptability in qualitative research. The full commitment of the participants underscores the robustness of the protocol and the feasibility of sustaining engagement over prolonged periods. A notable insight from the pilot study is the critical role of establishing strong rapport with gatekeepers, as it significantly facilitates access to relevant information, Malaysian polytechnics' institutional reports and documents related to business digitalization, thereby aiding the researchers' progress. This experience highlights the necessity of sustaining positive relationships with key stakeholders at both polytechnics included in this study, which greatly enhances the data collection process.

Developing a semi-structured interview protocol rigorously enhances the trustworthiness of this qualitative research method. Following the principles outlined by Merriam and Tisdell (2016), each step in the development process bolsters the study's credibility, confirmability, transferability, and dependability. *Credibility* focuses on how well the research captures reality by identifying patterns, addressing alternative explanations, and building logic models consistent with real-world phenomena (Yin, 2014). Standardizing semi-structured interview protocols aids in triangulating data from various stakeholders, such as student entrepreneurs, entrepreneurship mentors, and incubator managers. This comprehensive approach aligns with Creswell and Poth (2018), who highlight the importance of integrating diverse sources to create a thorough understanding of the studied phenomenon. Additionally, scrutinizing the interview protocol enhances *confirmability* by ensuring interview questions are clear, concise, and consistent, thereby reducing response ambiguity and ensuring uniformity in participant prompts, which increases data trustworthiness. Furthermore, the researchers also utilized the semi-structured interview protocol as a tool for reflexivity, critically examining their own biases, assumptions, and preconceptions that might affect data collection. This aligns with Lincoln and Guba (1985), who define confirmability as the extent to which the study's findings are shaped by the participants rather than researcher bias, motivations, or interests.

Following Yin (2016), *dependability* reflects the extent to which the findings can be considered credible, consistent, and replicable, highlighting the robustness and stability of the research process and outcomes. In this study, ensuring dependability involves evaluating the semi-structured interview protocol to see if it allows for sufficient flexibility to probe deeper into interesting or unexpected insights during interviews. This evaluation helps the researchers in identifying and rectifying any ambiguities, redundancies, or deficiencies in the protocol, enhancing its effectiveness before wider implementation. Stake (2010) identified *transferability* as a crucial aspect of research trustworthiness, as it improves the generalizability and relevance of the findings. Scrutinizing the interview protocol in this study's context involves considering contextual factors such as cultural norms, language

differences, and participant characteristics and documenting the rationale behind question selection, the development process and revisions made as highly emphasized in the SIPD framework. By addressing these factors in the design of the protocol, the researchers were able to increase data transparency and allow other scholars to assess the transferability of the data across diverse settings and populations to their own contexts.

Conclusion and Implication

The rigorous application of SIPD framework in this study demonstrates its efficacy in enhancing the reliability and depth of the qualitative research that is conducted by the researchers. By aligning interview questions with research objectives, integrating feedback from research teams or experts, and rigorously piloting the protocols, researchers can effectively capture detailed and nuanced experiences of participants involved in digital entrepreneurship initiatives. Each phase of the SIPD framework is shown to be crucial for ensuring that research questions are comprehensively addressed, interview protocols are meticulously refined, and ethical considerations are maintained to avoid harm and elicit valuable insights. The findings align with established principles of qualitative research, supporting the notion that ethical rigor in the development of interview protocols significantly contributes to the study's overall trustworthiness. The implication is that the SIPD framework can be a valuable tool for other researchers conducting qualitative studies, particularly in fields requiring deep exploration of participant experiences and perspectives. This is particularly relevant to understand the entrepreneurial motivation, incubator management strategies, and pedagogical approaches in implementing digital entrepreneurship education within Malaysian polytechnics' business incubation programs, where understanding the nuanced experiences of participants is crucial. This approach not only enhances the quality of the data collected but also provides a reliable framework for other researchers to replicate and adapt in diverse research contexts, thereby broadening the applicability and impact of qualitative research methods. Most importantly, this SIPD framework able to broaden the applicability and impact of qualitative research methods in informing policy, improving educational practices, and supporting the development of digital entrepreneurship ecosystems within Malaysian polytechnics and similar institutions worldwide.

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