Cyber-entrepreneurial intention among students in Public Universities: evidence from an Emerging Country

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Abstract
This paper aims to investigate the factors affecting cyber-entrepreneurial intentions among final-year students of public universities in Malaysia utilizing the Theory of Planned Behavior (TPB) and Theory of Self-Efficacy (TSE). The quantitative survey-based research method was adopted to conduct the study using both final-year undergraduate and postgraduate students from business and management schools to test the proposed research framework. A total of 364 useful responses were received to be analyzed for this study. Results showed that attitude toward entrepreneurship, entrepreneurial creativity, entrepreneurial knowledge, entrepreneurial orientation, entrepreneurial self-efficacy, and opportunity recognition were positively correlated with cyber-entrepreneurial intentions except for personal innovativeness in technology and subjective norm, which was insignificant. This study provides insights into the way individual’s intention towards cyber-entrepreneurship could be ameliorated as a career choice, particularly for final-year undergraduate and postgraduate students of business and management schools in Malaysian public universities. It helps determine appropriate approaches to direct the government, educators, and policymakers. The findings from this study invaluably contribute to the existing literature by establishing correlation between TPB and TSE and inquiring into their ultimate influences on cyber-entrepreneurial intentions.

Keywords Cyber-entrepreneurial intentions · Self-efficacy · Personal innovativeness · Entrepreneurial knowledge · Entrepreneurship · Malaysia
1 Introduction

Entrepreneurship is the key driver for economic development, serving as a ground for other entrepreneurial ideas to be turned into reality, thus accelerating the development cycle (Yunis et al., 2018). The drastic changes in national and international relations between the mode of production, labour market, and vocational training in industrial societies have recently transformed the entrepreneurship processes and successes (Teixeira et al., 2018). Cyber technologies such as the Internet, smartphones, and other software and applications that collect, archive, analyze, and transmit knowledge and information play a transformative role in the global economy, in particular, by changing the overall nature of entrepreneurship (Ben Youssef et al., 2020). The current generation, which is made of more digitally-connected entrepreneurs, is indeed being influenced by cyber-entrepreneurship more than a traditional business.

Cyber entrepreneurship is known as the creation of entrepreneurial or economic opportunities centered on cyber technologies. It has emerged in commerce as a revolutionary for opportunities in the context of technological changes and labor market uncertainty. It has lower operational costs and lower start-up levels than traditional brick-and-mortar types of business. Cyber entrepreneurship has slowly developed into a form of entrepreneurship that is easier to embrace and is more available to younger generations (Chang et al., 2020). Therefore, starting cyber-entrepreneurship reduces the initial start-up business costs, broadens markets, and eases the business problems related to establishment. Such an emerging field may act as a great leveller due to perceived lower barriers to entry, the entrepreneurial actor’s disembodiment, and the absence of visible markers of disadvantage online (Dy et al., 2017). Cyber entrepreneurship has low entry barriers; its start-ups generally do not need formal premises or costly facilities, and operations can be versatile because technical knowledge is either readily available or widely retained. Since it is an online business, cyber-entrepreneurs can work from everywhere and at every time. It differs from real-life shops, including expenses of renting and other factors, works set hours, and employees. Entrepreneurs also play a vital role in the modern economy, as they are responsible for innovative initiatives and for the creation of businesses that allow sustainable economic development (Ferreira et al., 2016).

To grasp the role of a cyber-entrepreneur (i.e., entrepreneurs who engage in cyber entrepreneurship), an entrepreneur’s concept must be understood. Entrepreneurs are individuals (or business owners) who aim to generate value by discovering and exploiting new goods, processes, and markets by developing or expanding economic activities (Mühlböck et al., 2018). They are sufficiently distinguishable from the traditional analogs; therefore, further investigation of their motivations, and the policies and ecosystems that lead to such a difference is needed (Bandera & Passerini, 2020).

Cyber-entrepreneurship is one of the most excellent alternatives to Malaysia’s most recent issue: unemployment. According to the unemployment report from the Department of Statistics Malaysia (2020) on Statistics of Labour Force in Malaysia as of August 2020 indicate that the unemployment rate has increased to 4.7% (compared to 3.3% in July 2020), which corresponds to 741.6 thousand people. Future cyber-entrepreneurs can indeed overcome this unemployment issue by generating income using low investment and long-term financial security, and will then provide absolute
freedom to approach local and international customers. In Malaysia, entrepreneurship development is growing steadily. Many Malaysian policies support entrepreneurs through funding, physical infrastructures, and business advisory services. The Malaysian government strives to reinforce creating quality cyber entrepreneurs who are at the same stage as the developed countries’ entrepreneurs. Many agencies have volunteered to provide the necessary help for Malaysia’s people. Based on the details found on export.gov (2019), Malaysia is an attractive e-commerce market in South East Asia due to its dynamic economy and digital technology infrastructure development.

Moreover, Malaysia has a total number of 25.84 million active internet users, making about 80% of the total population (export.gov, 2019). It was highlighted that from the total number of active internet users, 16.53 million of them are online shoppers (50% of the total population), and 62% of mobile phone users are shopping online with their devices. The involvement of Malaysians in cyber-entrepreneurship can help their home country to move toward a more advanced and prosperous economy.

Above all, the latest coronavirus pandemic (COVID-19) has also radically affected e-commerce. Some researchers are currently evaluating this pandemic’s ability to normalize the use of new technologies in incorporating processes permanently and successfully influence human activities in the future (Barnes, 2020; Papadopoulos et al., 2020). The pandemic’s cultural and economic effects have generated the reality of the new standards in the COVID era and necessitated a drastic change in business transactions and buying systems used by people. The Star (2020) report that online retail revenues for Malaysia increased by 28.9% in April 2020 due to COVID-19. According to an investigation conducted by Rakuten Insight Survey (2020) in Malaysia, 62% of the surveyed people said that they increased their online transactions by May 2020 because of social distancing and minimizing their outdoor time. The same study revealed that Malaysians interestingly made more online purchases during the pandemic (Statista Research Department, 2020). Therefore, buyers will be reluctant to go out and shop, which will affect the overall seller-buyer traditional journey. This scenario offers individuals a golden opportunity to develop their cyber-entrepreneurship. Indeed, taking advantage of right cyber-based businesses would be lucrative in the present situation.

Understandably, many graduates in business and management in Malaysian public universities are reluctant to be cyber-entrepreneurs and indicate to postpone it to a more distant future. It is also important to consider how to develop and nurture future cyber-entrepreneurship intentions (CEI). Opting cyber-entrepreneurship as a profession is necessary to minimize the unemployment rate and provide an increased income source with the rising cost of living (Ismail et al., 2012). Therefore, the present study attempts to answer the following research query:

RQ: What factors influence a student’s intention to be a cyber-entrepreneur in the future?

The results from this study could largely contribute to future graduates, higher education institutes, and the government in shaping future cyber-entrepreneurs. This research will also help future graduates recognize their characteristics, attitudes, skills, talents, and creativity to start cyber entrepreneurship. Higher education institutions are urged to build entrepreneurship strategies to inspire students to increase
their ability to be cyber-entrepreneurs. This study improves students’ expectations to ultimately begin cyber-entrepreneurship by focusing on content, lectures, and input that will enhance their intentions. Universities will, therefore, provide students with pressing real-world issues, improve critical thinking and increase their life skills. In the meantime, it will contribute to a better understanding of the roles of TPB and TSE in the context of entrepreneurship, proposing a framework that extends TPB via combining entrepreneurial knowledge and other psychological elements of TSE to support the findings about factors affecting cyber-entrepreneurial intentions.

2 Theoretical Background and hypotheses development

This study employed two theories including TPB and TSE. TPB, delineated by Ajzen (1991), was used to predict a person’s intention to participate in a specific behavior at a given time and place. It consists of three main components as attributions of intention formation. Lortie & Castogiovanni (2015) argued that the higher the intent to act, the more likely a person would execute the behavior. Feola et al., (2019) have proven that in predicting academic entrepreneurial intention (AEI), all psychological variables reflected in the TPB model (attitude, subjective norm, and perceived behavioral control) are indeed essential. Adopting TPB in this study provides a more in-depth understanding of factors influencing the final-year undergraduate/postgraduate students to be cyber-based entrepreneurs. Also, it offers an excellent framework and a particular viewpoint to better understand individuals’ cyber-entrepreneurial interests and intentions. TPB’s predictive ability could be strengthened by explicitly modeling entrepreneurial knowledge as a framework. It is a crucial factor that illustrates an individual’s mastery level and awareness about various areas of setting up and managing a new business and identifying the opportunities that will increase the intention to start their own businesses (Yaghoubi Farani et al., 2017). According to Ajzen (2002), perceived behavior control (PBC) was conceptualized as a unidimensional construct, almost identical to Bandura’s self-efficacy (Bandura, 1997). Hence, PBC has been an alternative to self-efficacy (SE) in this study. Overall, the way attitude toward both entrepreneurship and subjective norm influences an individual’s intention to start a cyber-based business will be tested in this study by combining entrepreneurial knowledge to test the validity of the extension for TPB, while evaluating its effect on CEI.

On the other hand, TSE is a psychological approach to an individual’s belief in their ability to execute an action to achieve what has been intended successfully. TSE is indeed a subset of Bandura’s social cognitive theory, which emphasizes on the role of observation learning and social experience in personality development (Bandura, 1986; Bandura et al., 1980) found that individuals’ intentions and behaviors are highly subjective to their beliefs in assigned tasks’ satisfaction. Subsequently, TSE also attempts to describe the relationships between values, attitudes, intentions, and behaviors (Tsai et al., 2016). A study conducted by Ladd et al., (2019)—significantly contributed to TSE as a driver to improve entrepreneurial intention among young entrepreneurs—helps educators improve young entrepreneurs’ intention to start up a new business. The perception of ability, which influences behavior, is indeed part
of the SE concepts (McGee & Peterson, 2019; Asante & Affum-Osei, 2019) strongly supported their framework by indicating that the SE belief is a significant predictor of human actions and behaviors. They argued that potential entrepreneurs with higher SE would be more inspired to seek opportunities, yielding a more substantial influence on opportunity recognition’s entrepreneurial intentions. However, based on previous studies, the influence of personal innovativeness on technology and opportunity recognition as a factor affecting personal traits would be inconsistent without considering the importance of personal creativity (Chang et al., 2020; Miao et al., 2017). Therefore, this study focuses on exploring the way a set of beliefs—entrepreneurial self-efficacy (ESE), entrepreneurial orientation, entrepreneurial creativity, personal innovativeness in technology, and the ability to recognize opportunities—can motivate final-year undergraduate students to establish a cyber-based business in future.

In conclusion, individuals typically choose behaviors that make them confident in managing and mastering. Therefore, using both TPB and TSE (each complementing the other in testing CEI) will enhance CEI’s understanding, which was missed out from other research works. The framework is presented in Fig. 1, consisting of nine constructs. The independent variables are entrepreneurial knowledge (EK), subjective norm (SN), attitude toward entrepreneurship (ATE), ESE, entrepreneurial orientation (EO), entrepreneurial creativity (EC), personal innovativeness in technology (PIT), and opportunity recognition (OR), while the dependent variable is only CEI.

### 2.1 Overview of the previous studies

Intention refers to part of the common-sense conception of mind and action that we sometimes intend to do things and that such intention typically to act in certain ways in the future (Velleman & Bratman, 1991; Syed et al., 2020) defined entrepreneurial intentions as individuals’ intentions to participate in events leading to creating a new company. However, CEI has been explained as an individual’s calculation of the probability of establishing and owning new e-commerce (Wang et al., 2016). Recent studies have focused on the cognitive approach of entrepreneurship process using intention-based models to explain how entrepreneurial behavior could be influenced by individuals’ intentions (Esfandiar et al., 2019; Fuller et al., 2018). CEI is indeed a phrase used to show readiness and willingness to be a cyber-entrepreneur, which can be calculated by the likelihood of beginning one’s own company after graduation.

Most of the literature (i.e., Chang et al., 2020; Feola et al., 2019; Fernández-Pérez et al., 2019) investigated the determinants of entrepreneurial intention by using samples collected from academic students in western countries. However, the present study seeks to contribute to that literature in the context of an emerging country, given that different countries have various traditions, beliefs, and norms that may affect the outcome. Previous studies have so far investigated entrepreneurship intention in general (Al-Jubari et al., 2019; Dutta et al., 2015; Fernández-Pérez et al., 2019; Jena, 2020; Nowiński & Haddoud, 2019; Roy et al., 2017) by concentrating on SE as a variable. This study aims to examine effects of SE factors on final-year students’ intentions to be cyber-entrepreneurs considering psychological variables of TPB. Based on the previous studies, such variables have so far remained solely
untested in understanding CEI. Table 1 provides an overview of prior studies on factors affecting entrepreneurial intentions. Extensive research has focused on the background of entrepreneurial intentions, leading to a general agreement among entrepreneurial researchers over cognitive factors’ role in defining entrepreneurial motivation (Shiri et al., 2017). Some of the previous studies have also investigated the way universities and higher education institutions handle and contribute to the entrepreneurial intention and demonstrated the important roles of higher educational levels in entrepreneurship (Fichter & Tiemann, 2018; Liñán & Chen, 2009).

The present research will contribute to a thorough vision of how TSE can be extended to establish a profound view of cyber-based entrepreneurship studies by incorporating several important variables in cyber-entrepreneurial studies. There are many discussions on entrepreneurship intention worldwide; however, only a few were conducted in Malaysia. This study, using a combination of TPB and TSE, aims
### Table 1 Review of the literature on CEI and EI

| Author                          | The objective of the study                                                                 | Theory Used                                      | Findings                                                                                                                                                                                                 | Country of Study | Sample                                                                 |
|---------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------------------------------------------------------|
| Chang et al., (2020)            | To explore the influence of the cyber-entrepreneurial self-efficacy (CESE) and the impact of positive thinking self-efficacy (PTSE) on cyber-entrepreneurial intentions (CEIs). | Social Cognitive Theory (SCT)                    | Many with high cyber-business self-efficacies often have high cyber-business intentions, and constructive thinking improves the relationship between the two self-efficacy and intentions. | Taiwan           | College students                                                       |
| Nowiński & Hadri-doud (2019)    | To examine the impact of role models, entrepreneurial behaviors, and self-efficacy          | Social Learning Theory and Theory of Planned Behavior | Inspirational role models, entrepreneurial attitudes and entrepreneurial self-efficacy are all essential to adopting entrepreneurial intentions.                                                                 | Poland           | University students (Business, Engineering, and Science schools)       |
| Jena (2020)                     | To examine the attitudes of students toward entrepreneurial education on the impact on entrepreneurial intention and investigate the role of control variables (e.g., gender and entrepreneurial family background). | Theory of Planned Behavior                      | The entrepreneurial intention has a significant relationship with attitude toward entrepreneurial education. The control variable family context significantly influences the relationship between attitude toward education and intention in entrepreneurship. | India            | University students from different business management colleges/universities |
| Fernández-Pérez et al., (2019) | To examine the thinking about interpersonal skills and their impacts particularly in shaping university students’ entrepreneurial intentions. | Theory of Planned Behavior                      | The individuals with higher degrees of social skills trained in entrepreneurship may have a more optimistic outlook toward entrepreneurship and can consider themselves more likely to become entrepreneurs. | Spain            | University students                                                    |
| Liñán & Chen (2009)             | To evaluate the test on applicability of the entrepreneurial intention model to various cultural settings. | Theory of Planned Behavior                      | Cultural ideals alter the way individuals view entrepreneurship in a growing society.                                                                                                                  | Spain and Taiwan | Final-year university students                                          |
| Roy et al. (2017)               | To examine the main objective of young S&T graduates to seek an entrepreneurial career in a developing country like India. | Theory of Planned Behavior                      | Perceived self-efficacy, which thoroughly mediates the interaction between entrepreneurial personality traits, EI, and sound business knowledge, facilitates having positive motivation. | India            | Science & Technology graduates from five premier technology institutes |
| Van Gelderen et al., (2015)     | To study behaviors or lack of behavior that match entrepreneurial intentions in development. | Theory of Planned Behavior                      | The findings show that self-control positively balances the relationship between purpose and behavior, and counters the increase of fear, doubt, and aversion associated with the behavior. | Finland          | General adult population (of 20–64 years old)                          |
| Author                  | The objective of the study                                                                 | Theory Used                                      | Findings                                                                                                                                                                                                 | Country of Study | Sample                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------------------------------------------------------|
| Al-Jubari et al., (2019) | To develop a more in-depth insight into the effective mechanisms involved in deliberate entrepreneurial behavior. | Theory of Planned Behavior Self-Determination Theory (SDT) | Via their attitudinal context: attitude, subjective norm, perceived behavioral control, essential cognitive needs of autonomy, competence, and affiliation have a major, indirect influence on entrepreneurial intention. | Malaysia         | 3rd and 4th-year undergraduate students from four public universities in Malaysia. |
| Elston and Weidinger (2019) | To explore the link between regional internationalization and Chinese entrepreneurship in China | Economic-based Entrepreneurship                    | The relatively higher rates of necessity-based entrepreneurs in China explains the regional differences found in overall entrepreneurship.                                                                 | China            | Firm-level results for 2001–2008 from the Global Entrepreneurship Monitor Adult Population Survey |
| Feola et al., (2019)       | Identify the forces which drive young researchers to start-up businesses based on their research findings. | Theory of Planned Behavior                        | In predicting AEI, all psychological variables of TPB are essential, while only some contextual and exogenous variables (i.e., government and industrial/financial support) directly influence AEI. | Southern Italy    | Ph.D. Students                                                        |
| S.-N. Zhang et al., (2020) | To discover how students’ entrepreneurial intentions affected through entrepreneurial education | Social Learning Theory                            | The results verify the positive effect of education on entrepreneurial intentions, and that social value and risk-taking will improve entrepreneurial goal development. | China            | Final-year students’ colleges and universities                        |
| Burnette et al., (2019)    | To verify whether a growth attitude intervention may be used to support students’ entrepreneurial self-efficacy and whether this, in fact, projected job growth | Implicit Theory Social Cognitive Self-Efficacy Theory | Interventions have modified attitudes effectively, fostering more robust development rates, and have improved self-efficacy in entrepreneurship.                                                           | USA              | Undergraduate college students from a public university (from introduction to entrepreneurship class) |
| Ip et al. (2018)           | To investigate the role of mediating entrepreneurial innovation for university students. | Theory of Planned Behavior                        | The findings suggest that SEI affects self-efficacy, confirmed by the proposed multiple mediation model across regions.                                                                               | Taiwan and Hong Kong | Five university students                                                |
Table 1 (continued)

| Author                  | The objective of the study                                                                 | Theory Used                                                                 | Findings                                                                                                                                                                                                 | Country of Study | Sample                                                                                     |
|-------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------|
| Wang et al., (2016)     | To explore student cyber-entrepreneurship intention factors by examining the relationship between the big five personality traits, intricate/external cyber-entrepreneurship motivation, and cyber-entrepreneurship intention. | Theory of Planned Behavior, Structural holes Theory of Structuration         | The correlation between intellectual cyber-entrepreneur motivation and the cyber-entrepreneur goal was identical.                                                                                         | Taiwan           | Final-year business undergraduates from seven higher-education institutions                |
| Shahab et al., (2019)   | Evaluating the developing market (China) and the mature market (Spain), to analyze the relationship between entrepreneurial self-efficacy (ESE) and intention (EI). | Theory of Self-Efficacy, Theory of Planned Behavior | The study indicates that the relationship between ESI and EI would be mediated by EC and ATE. In addition, with EE, people can develop EC effectively to manage their EI successfully. | China and Spain   | University students from two countries                                                     |
| Dutta et al., (2015)    | How entrepreneurial intentions in new technology industries grow.                         | Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Expectancy Theory, Regulatory Focus Theory | Viability awareness as the causes and outcomes of transition (i.e., mediators) through which the entrepreneurial intent is affected by personal technological developments and the related previous interactions and skills. | USA              | University students                                                                     |
to investigate the factors influencing CEI among the undergraduate/postgraduate students of business and management schools in public universities of Malaysia.

2.2 Hypotheses Development

2.2.1 Entrepreneurial knowledge (EK)

Ajzen (1998) showed that knowledge was an essential component of the TPB model’s foundation. Roy et al. (2017) supported their study by stating that Ajzen’s 2002 statement on entrepreneurship knowledge (EK) could be defined as a human capital that influences the perception of a person’s capacity in handling various entrepreneurial aspects and then contributes to a more realistic view of entrepreneurial activity. In the field of knowledge, entrepreneurship is not restricted to studying human society and social relationships, but rather is recognized by students as a future employment option, regardless of the field in which they study (Garrido-Yserte et al., 2020). Students’ experiences gained during their undergraduate studies will help them build knowledge about start-ups, planning, financing, management, laws and regulations governing start-ups, and the skills and intentions to start a new business (Ahmed et al., 2017; Fietze & Boyd, 2017; Gieure et al., 2019; Ilonen et al., 2018). EK, developed from entrepreneurial education, was found to influence subjective norm and the attitude of individuals and entrepreneurship intention (Ahmed et al., 2017).

Therefore, by implementing EK, we can thoroughly test the reliability of our extended TPB in the context of Malaysian citizens and final-year business and management school students, and examine its influence on CEI. It is then supported that specific individuals who have acquired entrepreneurial knowledge would show a positive attitude and subjective norm, and the following hypotheses have accordingly been formulated:

H1: Entrepreneurship knowledge has a positive impact on subjective norm.
H2: Entrepreneurship knowledge has a positive impact on attitude.

2.2.2 Subjective norm (SN)

SN focuses on the self-perceived burden of family, acquaintances, or significant others, which may or may not be a problem in choosing a business as a career (Roy et al., 2017). Aragon-Sanchez et al. (2017) addressed the relationship between access to financial, human, and cultural resources on the one hand, and the determinants of entrepreneurial intentions on the other, by influencing attitudes, subjective norms, and perceived controls of secondary students from Murcia and Spain, and found that subjective norm had a positive influence on entrepreneurial intention. Perception of the family’s attitude and thinking is considered as the primary source of the subjective norm, which measures behavioral intention to (or not to) engage in entrepreneurial actions (Liu & Zhao, 2020). A variety of studies have also investigated the effects of SN on various attitudes and circumstances, such as those involving the technology acceptance model (Schepers & Wetzels, 2007), purchase intention (Jain, 2020; Vafaei-Zadeh et al., 2022; 2019b; Vafaei Zadeh et al., 2018), agriculture intention (Rezaei et al., 2019), household environmental management (Wittenberg et al.,
As a result, given the well-established applicability of TPB to entrepreneurship, the following hypothesis has been proposed:

H3: Subjective norm has a positive impact on cyber-entrepreneurship intentions.

### 2.2.3 Attitude toward Entrepreneurship (ATE)

According to TPB, attitude is characterized as a learned predisposition to react to a given behavior (Fishbein et al., 1975). In the present study, attitude toward entrepreneurship (ATE) has been adapted as a learned predisposition to favourably or unfavourably carry out an entrepreneurial action (Shahab et al., 2019). In the entrepreneurship literature, an individual’s intention to start cyber-entrepreneurship automatically increases when the attitude toward entrepreneurship increases (Lechuga Sancho et al., 2020; Van Gelderen et al., 2015). Attitudes of graduate students in Oman highlighted that business knowledge, family experiences, risk acceptance, entrepreneurship education, and decision sharing had influenced their attitudes toward starting their own businesses (Ibrahim et al., 2017). Therefore, the following hypothesis has been proposed:

H4: Attitude has a positive impact on cyber-entrepreneurship intentions.

### 2.2.4 Entrepreneurial self-efficacy (ESE)

Bandura’s (1997) term, entrepreneurial self-efficacy (ESE), is known as the belief in personal ability to accomplish a mission and achieve the set goals. In cyber-based business, ESE is the degree of trust of persons in their cyber-entrepreneurship abilities, which could therefore predict CEI. Increasing ESE means an enhancement in ATE, which impacts the decision to start a business career (Rosique-Blasco et al., 2018). One investigation on understanding the way proximate and distant sociocultural contexts influence the well-established relationship between ESE and business intentions found that the significant impact of recognizing young entrepreneurs as drivers of entrepreneurial intentions for individuals with ESE is stronger than that of individuals who do not believe they can effectively launch a business venture (Schmutzler et al., 2019).

One of the latest studies conducted by Fragoso et al., (2020) to understand the entrepreneurial intentions among students has hypothesized that SE has no significant, positive impact on entrepreneurial intentions. However, the results did not support the hypothesis; instead, they have shown a positive relationship between high SE and entrepreneurial intentions. Arshad et al., (2016) examined the differential impact of ESE on individuals’ behaviors by mediating entrepreneurship attitude via combining the structure of the theory of gender schemes with individuals’ expected behaviors. As a result, a positive effect of ATE positively mediates ESE, and the following hypotheses are then made:

H5: Entrepreneurial self-efficacy has a positive impact on attitude towards entrepreneurship.

H6: Entrepreneurial self-efficacy has a positive impact on cyber-entrepreneurship intentions.
2.2.5 Entrepreneurial orientation (EO)

EO’s focus has so far been more on the organizational level (firm EO) (Vafaei-Zadeh et al., 2019a; Hanifah et al., 2021); therefore, minimal attention has been paid to evaluating EO at the individual level (Anderson et al., 2015). There is another form of EO at the individual level, which is called individual entrepreneurial orientation (IEO) (Bernoster et al., 2020). EO at this level can be defined as “the willing to take on risks and to be proactive in leading one’s organization, which are also important in other areas of life” (Langkamp Bolton & Lane, 2012, p.220). EO was also described as the characteristics that lead up to the action of new product development (Ladd et al., 2019; Rauch & Frese, 2007) emphasized that five dimensions could be covered in such studies, including aggressiveness, autonomy, innovativeness, proactivity, and risk-taking. In the context of university students, it was found that students with proper entrepreneurial education have a higher entrepreneurial orientation that leads to entrepreneurial intentions (Frunzaru & Cismaru, 2018). Therefore, the following hypothesis has been formulated:

H7: Entrepreneurial orientation has a positive impact on cyber-entrepreneurship intentions.

2.2.6 Entrepreneurial Creativity (EC)

EC is defined as the action of developing and implementing distinctive, identifiable, and useful ideas to start a new business (Amabile, 1996). Some previous works stated that innovation and entrepreneurship are related to creativity (Edwards-Schachter et al., 2015; Sarri et al., 2010; Chang & Chen, 2020) have mentioned that entrepreneurial creativity and imagination are essential, not only in the process of creating new products and services, but also in the process of selling new ideas and initiatives that seek moral standing, funding, and other supports essential to the success of new ventures. Several studies also found a direct relationship between EC and entrepreneurial intention (Kumar & Shukla, 2019; Biraglia & Kadile, 2017; Zampetakis et al., 2009), indicating that a better self-perception of creativity increases both the perceived value of becoming an entrepreneur and the self-confidence of the person’s entrepreneurial abilities. Therefore, the following hypothesis has been proposed:

H8: Entrepreneurial creativity has a positive impact on cyber-entrepreneurship intentions.

2.2.7 Personal innovativeness in Technology (PIT)

PIT refers to the degree a person wants to explore technology with any new thing or invention unique to a domain (Agarwal & Prasad, 1998; Dutta et al., 2015). Mancha and Shankaranarayanan (2020) stated that there is a connection between SE and digital technology, in a way that SE is linked to both the values of personal competence and innovativeness of individuals in technology. People with higher levels of innovation are often exposed to technology (Jokisch et al., 2020). A high level of innovation creates a positive attitude toward new technologies, and changes perceptions about task complexity, enhancing the willingness to use it as well (Fatima et al.,
Therefore, these studies strongly believe that PIT is directly related to CEI, and accordingly support the following hypothesis:

H9: Personal innovativeness in technology has a positive impact on cyber-entrepreneurship intentions.

2.2.8 Opportunity Recognition (OR)

OR is adopted as one of the criteria for entrepreneurial intentions, and entrepreneurs may implement the new ideas into action by starting their own entrepreneurship (Zhang et al., 2020). This process begins with identifying opportunities that can be used to recognize and incorporate novel ideas into a business concept, which, in turn, add values to consumers or society and generate revenue for entrepreneurs (Karimi et al., 2016). Although business ideas and entrepreneurial opportunities are conceptually different constructs, most scholars accept that opportunities are created over time beginning from an initial idea (Ploum et al., 2019). It appears that, in conjunction with SE, strategic action competence plays the same role as ESE in the idea recognition process, which will later turn into action (Almers, 2013; Ploum et al., 2019). If an individual tends to face competition from potential entrepreneurship—which helps capture entrepreneurial growth and opportunities they are more likely to start a business. Hence, the following hypothesis is proposed:

H10: Opportunity recognition has a positive impact on cyber-entrepreneurship intentions.

3 Research Methodology

3.1 Sampling

As the target respondents, an online survey was conducted among final-year undergraduate and postgraduate students of business and management schools in Malaysian public universities. The target respondents were selected based on the fact that they are well exposed to many aspects of the business world, a large emphasis on the practice of theory by applying case studies, problem-solving tasks, projects and teamwork, internships and training programmes, and developing targeted skills to produce entrepreneurs (QS TopUniversities, 2020). This study focuses on the education industry as the primary contributor to cyber-entrepreneurial intentions. Non-probability sampling method utilizing purposive sampling was applied. The selected respondents specifically fell into three categories: (i) final-year undergraduate or postgraduate students of business and management schools from all the public universities in Malaysia whose the number of graduates is increasing yearly (Department of Statistics Malaysia, 2020) and the main focus of these two schools is to create potential entrepreneurs; (ii) individuals who are yet to be cyber-entrepreneurs; and (iii) those who have smartphones or computers to carry out cyber-entrepreneurial activities.

G*power software based on Harris (2001) rule-of-thumb was used to perform power analyses specific to model setups. This model had a maximum of 7 predictors,
103 observations needed to detect a medium effect size of 0.15 to test the proposition. However, this study was arranged to collect data larger than the amount required.

Before circulating the survey, a questionnaire pre-testing was done with two undergraduates and two postgraduate students from a public university to ensure it was easier for prospective respondents to grasp the questionnaire elements. Moreover, expert validity was done by requesting two academicians in research methodology and entrepreneurship subject to review this study questionnaire. Minor changes to the questionnaires were made after pre-testing for better clarification. The final version of the questionnaires and the cover letter were distributed via e-mail and social media to prospective respondents being asked to participate in the study. A total number of 364 useful responses were obtained within three months, which could be attributed to our survey questionnaire design and following up with the respondents.

### 3.2 Measures

The constructs used in this study are measured over a five-point Likert scale that ranged from 1 (absolute ignorance/extremely unsupportive/not at all important/strongly disagree) to 5 (complete knowledge/extremely supportive/very important/strongly agree) except for CEI with seven-point Likert scale ranged from 1 (strongly disagree) to 7 (strongly agree). The nine variables’ measurement items were adapted from the previous studies and were summarized in Appendix A.

### 3.3 Common method bias (CMB)

Harman’s single factor score was used to determine the existence of common method bias (CMB) in the process (Podsakoff et al., 2003). The CMB is said to be present if variation in a single variable is more than 50% by minimizing the (unrotated) extraction factor to one factor (Podsakoff et al., 2003). In this analysis, the findings showed that only 43.57% of the overall variance accounted for a single factor solution, indicating that CMB was not a problem.

### 4 Data analyses and results

#### 4.1 Demographic analysis

In terms of educational qualifications, 218 respondents (59.9%) held a bachelor’s degree, followed by 146 master’s degrees (40.1%). The number of female respondents was 216 (59.3%) and male respondents were 148 (40.7%). In this study, four age groups were set. There were 211 respondents within the 18–25 years old group (28%), 151 within the 26–35 group (48.3%), and 2 within the 36–45 group (12.7%). In terms of civil status, 288 (79.1%) of the respondents were single, 74 of students (20.3%) were married and the least respondents were divorced (0.3%) and widowed (0.3%) with a total headcount of 1 each.


4.2 Data analysis

Version 3.3 of the SmartPLS programme (Ringle et al., 2015) was used to approximate the study model, and to assess the validity of the given set of variables in a common way, based on the fact that it has recently gained significant interest in several disciplines, including marketing (Hair et al., 2012), strategic management (Hair et al., 2012) and operations management (Peng & Lai, 2012; Chin, 1998) indicated that it is appropriate to be larger than 0.707 for standardized loadings. The mean-variance derived is a summary measure for the convergent validity of constructs (AVE), which has to be >0.5 for all constructs. An AVE value of 0.50 or larger implies that at least half of the variation in items can be accounted for by latent constructs, and there is sufficient convergent validity of the measurement scale (Hair et al., 2014). As a new approach to testing discriminant validity in variance-based SEM, Henseler et al., (2015) proposed the heterotriat-monotriat ratio of correlations (HTMT). For the factor correlation, the HTMT is approximated and should be significantly smaller than one (Henseler et al., 2015). If the HTMT value is <0.85 (Kline, 2011), then the constructs are not distinct. In order to analyze the coefficient of the significance of path modeling, the bootstrapping approach was also applied.

5 Results

The PLS algorithm findings showed that all object loads were >0.707, except the item names ATE1, ATE3, and EO10, which were less than 0.707. The PLS algorithm results also indicated that all item loadings were larger than 0.707 except ATE 1, ATE3, and EO10, which were <0.707. According to Hair Jr et al. (2017), items are acceptable even if the loading is less than 0.707 if the variable’s AVE is above 0.5. All the obtained AVE values are larger than 0.50, indicating convergent validity at the level of construct. Therefore, ATE1, ATE3, and ATE10 have not been dropped. Table 2 shows that all the composite reliability values are >0.70, indicating reasonable reliability. Figure 2 presents the value of $R^2$ for endogenous variables. The $R^2$ explains 55% of the variance for attitude towards entrepreneurship, 15% for subjective norm, and 66% for cyber-entrepreneurial intentions.

All the HTMT values are below 0.85 according to Table 3. Therefore, appropriate discriminant validity of the measurement model is achieved. Table 4 shows results of the structural model obtained from the PLS production. EK has a positive impact on SN (H1: $\beta=0.38$, $t=7.322$ and $p=0.000$) and ATE (H2: $\beta=0.433$, $t=8.164$ and $p=0.000$). However, SN negatively correlates with CEI (H1: $\beta = -0.01$, $t=0.236$ and $p=0.407$) and does not support the hypothesis. ATE (H1: $\beta=0.429$, $t=6.869$ and $p=0.000$) and EO (H1: $\beta=0.238$, $t=3.261$ and $p=0.001$) have positive correlations with CEI. ESE has also a positive impact on ATE (H1: $\beta=0.435$, $t=7.971$ and $p=0.000$) and CEI (H1: $\beta=0.219$, $t=2.775$ and $p=0.003$). EO (H1: $\beta=0.158$, $t=2.109$ and $p=0.018$) and EC (H1: $\beta=0.124$, $t=2.261$ and $p=0.012$) positively affect CEI while PIT (H1: $\beta = -0.016$, $t=0.246$ and $p=0.403$) has a negative correlation with CEI and does not support the related hypothesis.
| Construct                                      | Item | Loadings | CR  | AVE  |
|-----------------------------------------------|------|----------|-----|------|
| Cyber – Entrepreneurial Intentions            | CEI1 | 0.879    | 0.964 | 0.817 |
|                                               | CEI2 | 0.912    |       |      |
|                                               | CEI3 | 0.931    |       |      |
|                                               | CEI4 | 0.926    |       |      |
|                                               | CEI5 | 0.891    |       |      |
|                                               | CEI6 | 0.884    |       |      |
| Entrepreneurial Knowledge                     | EK1  | 0.805    | 0.922 | 0.704 |
|                                               | EK2  | 0.797    |       |      |
|                                               | EK3  | 0.840    |       |      |
|                                               | EK4  | 0.860    |       |      |
|                                               | EK5  | 0.889    |       |      |
| Subjective Norm                               | SN1  | 0.749    | 0.850 | 0.588 |
|                                               | SN2  | 0.841    |       |      |
|                                               | SN3  | 0.722    |       |      |
|                                               | SN4  | 0.749    |       |      |
| Attitude towards Entrepreneurship             | ATE1 | 0.632    | 0.845 | 0.530 |
|                                               | ATE2 | 0.724    |       |      |
|                                               | ATE3 | 0.519    |       |      |
|                                               | ATE4 | 0.858    |       |      |
|                                               | ATE5 | 0.849    |       |      |
| Entrepreneurial Self-Efficacy                 | ESE1 | 0.896    | 0.950 | 0.792 |
|                                               | ESE2 | 0.902    |       |      |
|                                               | ESE3 | 0.821    |       |      |
|                                               | ESE4 | 0.892    |       |      |
|                                               | ESE5 | 0.935    |       |      |
| Entrepreneurial Orientation                   | EO1  | 0.740    | 0.943 | 0.625 |
|                                               | EO2  | 0.726    |       |      |
|                                               | EO3  | 0.825    |       |      |
|                                               | EO4  | 0.851    |       |      |
|                                               | EO5  | 0.844    |       |      |
|                                               | EO6  | 0.845    |       |      |
|                                               | EO7  | 0.819    |       |      |
|                                               | EO8  | 0.823    |       |      |
|                                               | EO9  | 0.775    |       |      |
|                                               | EO10 | 0.630    |       |      |
| Entrepreneurial Creativity                    | EC1  | 0.773    | 0.925 | 0.637 |
|                                               | EC2  | 0.812    |       |      |
|                                               | EC3  | 0.773    |       |      |
|                                               | EC4  | 0.844    |       |      |
|                                               | EC5  | 0.856    |       |      |
|                                               | EC6  | 0.764    |       |      |
|                                               | EC7  | 0.761    |       |      |
| Personal Innovativeness in Technology         | PIT1 | 0.860    | 0.913 | 0.724 |
|                                               | PIT 2 | 0.908   |       |      |
|                                               | PIT 3 | 0.762   |       |      |
|                                               | PIT 4 | 0.868   |       |      |
PLS\textsubscript{predict} was used to examine the model’s predictive relevance. Shmueli et al., (2019) proposed PLS\textsubscript{predict}, a holdout sample-based procedure that generates case-level predictions on an item or a construct level using the PLS\textsubscript{Predict} with a 10-fold procedure. Shmueli et al., (2019) suggested that if all the item differences (PLS-LM) were lower than PLS model, there is high predictive power. There is medium predictive power when the majority item differences in LM are lower than the PLS model, while there is low predictive power if the minority item differences in LM are lower than the PLS model, then. Based on Table 5, the majority of the errors of the PLS model were lower than the LM model. Thus, we conclude that our model has a medium predictive power.

6 Discussion

6.1 Relationship between EK and SN

It has been revealed that EK, with a medium effect size ($f^2=0.177$), has a positive impact on SN, which agrees with Roy et al. (2017). However, this study’s obtained effect size is markedly smaller than 0.305 reported by Miralles et al., (2016). Indeed, individuals with higher EK are less likely to be influenced by negative comments from family, friends, and surroundings as they know how to differentiate between good and bad cyber-entrepreneurs. The present findings and those of the literature reveal the fact that EK enables entrepreneurial-minded students from a public university to identify the activities of a cyber-based business association in Malaysia and to recognize the appropriate business support bodies for further assistance in terms of training, loan, and technical aid to start their own cyber-based businesses. EK also enables them to enhance a mutual support network by getting support from family, friends, and surroundings, with the knowledge acquired from entrepreneurship courses, entrepreneurship programs, social media and other reliable sources. Respondents tend to make their own business plans acceptable and then get support from their families and friends. Therefore, universities should increasingly expose undergraduate and postgraduate students to the real business world and thus, make them well-prepared to start cyber-entrepreneurship.

6.2 Relationship between entrepreneurial knowledge and attitude towards entrepreneurship

EK’s impact on an individual’s attitude toward entrepreneurship is found to be considered with a large effect size ($f^2=0.326$). ATE can be shaped based on the knowl-
edge level they have toward entrepreneurship. The present findings, in line with the
assertions of Yaghoubi Farani et al., (2017), have supported the same argument. Higher entrepreneurial knowledge stabilizes the entrepreneur’s decision-making pro-

Table 3 Discriminant Validity (HTMT<sub>.85</sub> Ratio)

| Construct                     | ATE | CEI | EC   | EK   | EO   | ESE  | OR   | PIT  | SN   |
|-------------------------------|-----|-----|------|------|------|------|------|------|------|
| Attitude Toward Entrepreneurship (ATE) |     |     |      |      |      |      |      |      |      |
| Cyber – Entrepreneurial Intentions (CEI) | 0.825 |     |      |      |      |      |      |      |      |
| Entrepreneurial Creativity (EC) | 0.598 | 0.477 |      |      |      |      |      |      |      |
| Entrepreneurial Knowledge (EK) | 0.766 | 0.525 | 0.525 |      |      |      |      |      |      |
| Entrepreneurial Orientation (EO) | 0.625 | 0.676 | 0.676 | 0.506 |      |      |      |      |      |
| Entrepreneurial Self-Efficacy (ESE) | 0.734 | 0.751 | 0.613 | 0.507 | 0.848 |      |      |      |      |
| Opportunity Recognition (OR) | 0.721 | 0.727 | 0.717 | 0.601 | 0.780 | 0.814 |      |      |      |
| Personal Innovativeness in Technology (PIT) | 0.527 | 0.527 | 0.739 | 0.490 | 0.700 | 0.641 | 0.819 |      |      |
| Subjective Norm (SN) | 0.574 | 0.474 | 0.520 | 0.467 | 0.609 | 0.537 | 0.531 | 0.343 |      |

Table 4 Hypothesis Testing

| Hypothesis | Relationship | Coefficient | Std. Dev | t-value | R² | f² | VIF | p-value | Supported |
|------------|-------------|-------------|----------|---------|----|----|-----|---------|-----------|
| H1         | EK → SN     | 0.387       | 0.053    | 7.322*** | 0.277 | 0.552 | 0.177 | 1.000 | p<0.001  | YES       |
| H2         | EK → ATE    | 0.433       | 0.053    | 8.164*** | 0.277 | 0.552 | 0.326 | 1.279 | p<0.001  | YES       |
| H3         | SN → CEI    | -0.010      | 0.042    | 0.236  | 0.519 | 0.665 | 0.000 | 1.531 | 0.407    | NO        |
| H4         | ATE → CEI   | 0.429       | 0.062    | 6.869*** | 0.288 | 1.907 | p<0.001 | YES    |           |
| H5         | ESE → ATE   | 0.435       | 0.055    | 7.971*** | 0.329 | 1.279 | p<0.001 | YES    |           |
| H6         | ESE → CEI   | 0.219       | 0.079    | 2.775**  | 0.040 | 3.588 | 0.003 | YES    |           |
| H7         | EO → CEI    | 0.158       | 0.075    | 2.109*   | 0.022 | 3.400 | 0.018 | YES    |           |
| H8         | EC → CEI    | 0.124       | 0.055    | 2.261*   | 0.021 | 2.160 | 0.012 | YES    |           |
| H9         | PIT → CEI   | -0.016      | 0.063    | 0.246  | 0.000 | 2.626 | 0.403 | NO     |           |
| H10        | OR → CEI    | 0.238       | 0.073    | 3.261*** | 0.045 | 3.776 | 0.001 | YES    |           |

Note: ATE=Attitude Towards Entrepreneurship, CEI=Cyber – Entrepreneurial Intentions, EC=Entrepreneurial Creativity, EK=Entrepreneurial Knowledge, EO=Entrepreneurial Orientation, ESE=Entrepreneurial Self-Efficacy, OR=Opportunity Recognition, PIT=Personal Innovativeness in Technology and SN=Subjective Norm

* = p≤0.05, ** = p≤0.01 and *** = p≤0.001

Table 5 PLS<sub>Predict</sub>

| Construct | Q² predict | RMSE | RMSE | RMSE | RMSE |
|-----------|------------|------|------|------|------|
| CEI1      | 0.350      | 1.365| 1.403| -0.038|      |
| CEI2      | 0.461      | 1.386| 1.374| 0.012 |      |
| CEI3      | 0.437      | 1.303| 1.240| 0.063 |      |
| CEI4      | 0.499      | 1.217| 1.252| -0.035|      |
| CEI5      | 0.452      | 1.276| 1.294| -0.018|      |
| CEI6      | 0.434      | 1.187| 1.311| -0.124|      |
cess, and the potential cyber-entrepreneur will realize the difference between good and flawed decision-making processes. Additionally, potential cyber-entrepreneurs will be able to be more passionate, and braver in facing with any situation regarding cyber-entrepreneurship and be ready to make flexible insights so that they can enhance a course that seems to fail eventually. The students will also develop strong work ethics as a cyber-entrepreneurship and start with a higher level of integrity through knowledge. Attitude is indeed everything in entrepreneurial life. To obtain the right attitude, entrepreneurial knowledge has a highly-significant impact accordingly. The development of entrepreneurial expertise, which can be obtained from various sources including education, programs, business events, social media, and trainings plays an essential role in shaping ATE positively. As they benefit from real-world scenarios and theoretical understanding of business creation, the educational system in Malaysia should be updated to develop practical knowledge so that more cyber-entrepreneurs could contribute to the country’s economic growth.

6.3 Relationship between subjective norm and Cyber–Entrepreneurial Intentions

Subjective norm (SN) was proved to be not significant for the prediction of CEI, in agreement with Thelken & de Jong (2020), Brusch & Rappel (2020), and Krueger et al., (2000). One of the most commonly-reported shortcomings in the relationship between SN and intentions within TPB is its marked weakness. The TPB author Ajzen (1991), in a way that intentions were largely affected by personal interests, such as attitudes and perceived behavioral control. One possible explanation for the contradictions in the significance of SN could arise from the fact that a particular behavioral variable is already present in the desirability of implementing the action. Based on the present analysis, it can be interpreted in a way that the respondents do not depend on the opinions of their important people to consider cyber-entrepreneurship as a career. Additionally, regardless of receiving support from parents and friends, the respondents will still choose to be a cyber-entrepreneur, showing that the cyber-entrepreneurial career choice depends on personal considerations more than on social or normative concerns. Finally, the decision-making of entrepreneurial careers is so strong that young people cannot largely be influenced by others’ opinions.

6.4 Relationship between attitude towards Entrepreneurship and Cyber–Entrepreneurial Intentions

An appropriate ATE is essential to start cyber-entrepreneurship, which needs to be developed early. Analyzing the results obtained from the 4th hypothesis show a positive correlation between ATE and CEI with a large effect size ($f^2 = 0.288$). According to the hypothesis, the intention to start cyber-entrepreneurship will increase as attitudes increase. Results reinforce attitude as essential precursor to creating a cyber-entrepreneurship, just like some of the previous studies (Al-Jubari et al., 2019; Lechuga Sancho et al., 2020). As a career option for a final-year student from business and management schools, being a cyber-entrepreneur will be a desirable option to choose, especially if the students are well-prepared with sufficient resources and are able to identify the opportunity. A student with a positive ATE would indeed be willing to
do anything to be a cyber-entrepreneur because they perceive cyber-entrepreneurship as a real advantage, which yields 100% self-satisfaction. This research shows that attitude plays a significant role in motivating the students to be cyber-entrepreneurs rather than choosing other career options. Moreover, persons with a positive attitude will be able to perform their tasks better and achieve their goals finally.

6.5 Relationship between entrepreneurial self-efficacy and attitude towards entrepreneurship

Hypothesis 5 focuses on how ESE impacts a student’s attitude toward entrepreneurship. It may be said that students with greater self-efficacy have accordingly stronger attitudes (Bachmann et al., 2020). Such results obtained for ESE are supported in the present research with a large effect size ($f^2=0.329$), establishing a positive correlation between ESE and ATE. SE is part of a person’s attitude. Therefore, any entrepreneurial activity that positively influences students’ attitudes also impacts their ESE beliefs. Students who have higher confidence in their abilities to successfully play entrepreneurial roles and responsibilities with minimal or without anxiety will have a more significant ATE with a high confidence level. The findings make it clear that anxiety can decrease and be replaced by a positive attitude with a rise in ESE. Students with high ESE, though demanding, will complete tasks and perceive obstacles as challenges that need to be solved, rather than risks that need to be prevented. Students would also cultivate a positive attitude by high efficiency.

6.6 Relationship between Entrepreneurial Self-Efficacy and Cyber–Entrepreneurial Intentions

ESE plays an important role in defining a person’s confidence in his/her capacity to carry out entrepreneurial roles and responsibilities effectively. However, according to the present study, there is a significant, positive relationship between students’ ESE and CEI with a low effect size ($f^2=0.040$). The related output is in line with the previous studies carried out by Fragoso et al., (2020). In general, students with a higher sense of ESE will be able to develop a greater interest in the entrepreneurial activities they are involved in, to create a stronger sense of dedication to their interests and operations for their cyber-based business, to rebuild from setbacks and disappointments quickly, and to classify challenging issues as tasks to be accomplished. Moreover, the results also reveal the students’ abilities to be successful entrepreneurs because they believe in their confidence to perform and identify business opportunities. To create products and reach the target markets creatively, students need to get frequently involved in business activities carried out by the universities to enhance their ESE and to boost their intentions to be cyber-entrepreneurs.

6.7 Relationship between Entrepreneurial Orientation and Cyber–Entrepreneurial Intentions

By definition, EO covers five dimensions: aggressiveness, autonomy, innovativeness, proactivity, and risk-taking, which all of them influence CEI. The direct implication
of this finding is that people with high levels of EO are even more likely to take bold actions to be cyber-entrepreneurs. Results also indicate a positive and significant small effect size ($f^2=0.022$), in agreement with Mahfud et al., (2020) with samples prepared from the polytechnic students. This explains why students with higher EO levels show the characteristics of product and market innovation, willingness to pursue risky businesses and the pioneering of innovations, and independence in executing ideas. On the other hand, competitive aggressiveness means the propensity to challenge and outperform existing rivals in the market. Adding to it, the student will never sit and wait for the opportunities to knock on, rather they will continuously look for new opportunities to explore the world of cyber-entrepreneurship.

### 6.8 Relationship between Entrepreneurial Creativity and Cyber–Entrepreneurial Intentions

The eighth hypothesis postulates a positive relationship between EC and CEI with a small effect size ($f^2=0.021$). The students’ abilities to implement unique and accurate ideas to launch a new venture are then found to be positively correlated with CEI, in agreement with empirical surveys of Laguía et al., (2019) and Shahab et al., (2019). In general, people with higher EC tend to be more encouraged to start cyber-entrepreneurship because they believe that they are very creative with many ideas to implement and solve all the challenges differently. Creative thinking helps a potential cyber-entrepreneur look at any problem and situation from a new and different point of view and then create new products and concepts for cyber-entrepreneurship. Students who think they have low EC are encouraged to promote intellectual skills by learning new hobbies and practicing challenges. This helps them develop their creativity, exercise their innovative behaviors, and contribute to their entrepreneurial journey before starting their own cyber-entrepreneurship.

### 6.9 Relationship between personal innovativeness in Technology and Cyber–Entrepreneurial Intentions

Here, PIT is found to adversely affects CEI and therefore does not support the 9th hypothesis, in agreement with Brusch & Rappel (2020). It can then be concluded that students with higher PIT could also be too technically-oriented, and consequently, ignore other critical cyber-entrepreneur skills and knowledge. PIT does not play a significant role for students in being a cyber-entrepreneur, and one does not need to be excellent in technology innovativeness to start cyber-entrepreneurship. The obtained result explains that students do not need to be the first person to try technologies for creating cyber-entrepreneurship. PIT is especially relevant when it comes to highly innovative technology. The respondents have indicated that to be a cyber-entrepreneur only requires a simple technology usage knowledge. For start-ups, a cyber-entrepreneur only needs to be aware of the technology platforms for selling the products, with which they have already become familiar during instant shopping. Therefore, PIT is not crucial for the particular constructs.
6.10 Relationship between Opportunity Recognition and Cyber–Entrepreneurial Intentions

Results show that OR positively affects CEI with a small effect size ($f^2=0.045$). Students with higher OR skills will be able to identify the opportunities to start their own cyber-based businesses with ideas that can be turned into new products and services and then generate more profits. The ability to identify business opportunities is a significant attribution to a cyber-entrepreneurship start-up. A potential entrepreneur must decide to take advantage of the opportunity when he/she gets a chance. It has been stated that OR plays a part in starting entrepreneurship (Kuckertz et al., 2017), therefore, it is a must to understand that the higher a person’s ability to recognize opportunities, the higher the urge to start cyber-entrepreneurship.

7 Study contribution

7.1 Theoretical contribution

First, the present study is one of the few that attempted to investigate the CEI of a public university in the Malaysian context, with an exclusive focus on final-year undergraduate/postgraduate students of business and management schools. The unexpected in-significancies found in this study are related to SN and PIT, which can be explained respectively by Thelken & de Jong (2020) and Brusch & Rappel (2020). This indicates that respondents may not be influenced by their important people’s opinions about starting cyber-entrepreneurship (for SN) and do not need to be advanced in technology usage to start cyber-entrepreneurship. In other words, a high level of CEI is not necessarily associated with high SN or PIT.

Second, previous studies have largely focused on TPB to analyze the way the factors affect CEI, therefore, less attention has been paid to TSE. This study provides a new way of analyzing the choice of being a cyber-entrepreneur. In this context, this study has added value to the literature by offering new insights into the factors impacting cyber-entrepreneurship. The theory indeed yields a deeper understanding of the factors that influence one’s intention to start a cyber-based business in Malaysia. This study also extends TSE in which the self-efficacy background includes ESE, EO, EC, PIT, and OR variables. Perceived self-efficacy often refers to the cognitive evaluation of a person’s ability to perform particular entrepreneurship activities. Thus, the degree of self-efficacy could be improved by adequate training and evolution.

Lastly, this study also extends the existing EK and contributes to TPB by testing the “external factor” of EK on ATE and SN toward being a cyber-entrepreneur, being also positively correlated to ATE and SN. The present research provided an empirical evidence for the concept that EK can be used to positively affect an individual’s decision to begin cyber-entrepreneurship. Yet, it influences CEI through the mediation of ATE and SN. This study supports the importance of the well-planned entrepreneurial curriculum, which will increase the number of both potential and existing entrepreneurs by enhancing the presence of cyber-entrepreneurship as a viable career choice, especially for students from business and management schools. Our findings
show these belief systems are critical in the entrepreneurship domain. This study also provides an essential beginning for a better understanding of students’ CEI at a relatively early development stage, and could encourage researchers to explore the relationships between the both variables ATE and SN and other factors of interest as described previously.

7.2 Practical contribution

Our proposed model provides a better understanding of the factors influencing CEI and the way experience, knowledge, and personality impact enterprising intentions among final-year undergraduate and postgraduate students of business and management schools in Malaysia’s public universities.

7.2.1 Higher Institution and Educational policymakers

While universities offer entrepreneurial courses, this may not be enough to inspire entrepreneurship among students. We currently do not have a robust explanation of the way unique entrepreneurship skills affect CEI and this paper aims to fill this gap. Educational institutions must focus on developing creative entrepreneurship courses using an approach to shape a thinking far more effective than formal lessons, which also provides students with the necessary background and opportunity to solve complex issues of real-world cyber-entrepreneurship. Providing entrepreneurship courses will allow students to understand entrepreneurial opportunities, engage more in learning processes, develop more skills, and concentrate on future career plans. (Lynch et al., 2019). University faculties, students, and higher education entrepreneurial initiatives will benefit from promoting and growing entrepreneurship among the students. The present research provides insights into students’ profiles with the right entrepreneurial intentions, which can be used to develop training programmes that stimulate traits, expertise, and skills. It is suggested that practical workshops aiming at developing interpersonal skills, self-knowledge, teamwork, and other required skills should be included in entrepreneurship programs. This study’s analytical findings can be of practical value for policymakers as they can lead to developing new policy initiatives to foster cyber-entrepreneurial cultures and improve current entrepreneurial ecosystems.

7.2.2 Government

It is advisable to create more entrepreneurship programmes focusing on cyber and accelerators to improve job creation and social welfare. The government has considerable responsibility in promoting the cyber-entrepreneurial spirit among the Malaysians, and should encourage the cyber-entrepreneurial spirit. With the existing political establishment, Malaysia’s government is ensuring that the cyber-entrepreneurial spirit is cultivated among the people. The government should collaborate more with the agents that could provide cyber-entrepreneurial knowledge and guidance, and the program will strive to remove some of the obstacles that have undermined youth self-confidence and self-esteem of cyber-entrepreneurs in Malaysia
regardless of age. This also has real policy ramifications for governmental and non-governmental organizations (NGOs) that support the required IT operations in rural areas, provide financial support and other tools to educate cyber-based platforms in all universities, and encourage students to get involved in cyber-business activities. Malaysia then needs to incorporate students into all its business planning activities, including the business attitude and purpose.

7.2.3 Individual

This study is relatively important to provide awareness for every individual who wants to be a cyber-entrepreneur. In view of the fact that final-year undergraduate and postgraduate students of business and management schools valued all of the addressed variables extremely positive, it influenced the cyber-entrepreneurial intentions. The significant relationship between ATE, EK, EC, EO, ESE, and OR suggested that this segment of the population is favourable to cyber-entrepreneurship in Malaysia. To mould cyber-entrepreneurship among undergraduate and postgraduate students, more practical experiences should be facilitated by fostering students to build a business idea and design and integrate the concept as one of the universities’ main goals. The present work could be used to motivate and improve their EK and to develop their entrepreneurial skills. It could be indicated that the intention to become a cyber-entrepreneur is a complex and personal decision, which is largely shaped by students’ ATE and self-efficacy factors. This paper could also offer feedback on the skills and expertise that students need to improve in order to effectively launch their own cyber-entrepreneurship. Therefore, students should take the initiative to learn and plan to accomplish their objectives on beginning their own cyber-based businesses. With skills and interest strengthened, they can make cyber-entrepreneurship a major career.

8 Limitation

The study population and the sample used within this study have been limited to undergraduate and postgraduate students of business and management school from Malaysia’s public universities. Even though the business and management schools aim to develop broad business knowledge and acquire the related skills, some of the well-established entrepreneurs are from other schools and departments with non-related, non-business backgrounds, like Datuk Seri Hasmiza Othman, Mark Zuckerberg, Ma Huateng and Jack Ma. More interestingly, some people with no higher educational background have also successfully started their entrepreneurship such as Datuk R. Doraisingam Pillai, Walt Disney, Bill Gates, and Henry Ford. Therefore, focusing on potential cyber-entrepreneurs with and without diverse educational backgrounds largely differs. Secondly, because this study has focused on final-year students of business and management schools of public universities in Malaysia, the obtained results may not apply to other cultural, social, geological, and even business contexts. Future research can therefore focus on samples from other cultural, business, and social contexts in emerging countries like Malaysia as well as in other
developed countries, regardless of whether the obtained results would be different. The generalizability of these variables may contribute to a better understanding of their behaviors and intentions. Lastly, such a local study, is insufficient to address CEI-related issues, and could gain more if there is more information about a cyber-entrepreneur in the past local survey. Implications of the present theoretical model will also be more acceptable with the support of a local study, and several other variables can be used to evaluate the cyber-entrepreneurial intentions. Future studies may provide more findings that better reflect the multiple facets of cyber-entrepreneurship.

9 Future Research

This research may be expanded to examine the disparities in CEI between students studying in other programmes with a diverse educational background, or generalizing the collection of samples from public universities. To further confirm CEI, attempts should be made to use students from universities in other regions of the country or the globe with diverse educational backgrounds. The platform could also be evaluated for non-students or uneducated people. It may be a beneficial tool to recognize job prospects and assess potential cyber-entrepreneurs requiring assistance from small business development centers. While TPB continues to be an essential theoretical framework for studying CEI (Chang et al., 2020; Feola et al., 2019; Jena, 2020; Van Gelderen et al., 2015), some other theories could also be used to build more complex frameworks for student entrepreneurial decision-making that are ideally connected to developing countries worldwide like Malaysia. A cross-cultural analysis of cyber-business intentions will significantly increase the outputs and investigate the effects of cultural gaps on cyber-entrepreneurial intentions. Therefore, researchers should strive to apply comprehensive SN that captures more than one dimension of the social pressure of individual experiences in doing certain behaviors. In this context, Ham et al., (2015) highlighted the marginal relationship between SN and CEI. It offers clear motivations for studying in this field by applying the two dimensions of descriptive and social norms for the subjective norms component.

10 Conclusion

The present study explores factors affecting cyber-entrepreneurial intentions among final-year undergraduate and postgraduate students of business and management schools of public universities in Malaysia, who have been educated with entrepreneurship knowledge and the required skills. Theory of planned behavior (TPB) and theory of self-efficacy (TSE) were used as a theoretical lens to establish a research model. The number of 10 hypotheses were proposed, which investigate the relationship between entrepreneurship attitude, entrepreneurial creativity, entrepreneurial knowledge, entrepreneurial orientation, entrepreneurial self-efficacy, opportunity recognition, personal innovativeness in technology, and subjective norm on one hand, and cyber–entrepreneurial intentions (CEI) on the other, within the aforementioned context. It has been verified that all the variables have strong connections with CEI.
except subjective norm (SN) and personal innovativeness in technology (PIT) with marginal impacts, adding value to the literature as well. Future researchers may consider other cultural, financial, and social contexts to extend the literature in this line.

## 11 Appendix A. List of items by construct

| Construct (references) | Items |
|------------------------|-------|
| **Cyber – Entrepreneurial Intentions (Liñán & Chen, 2009)** | CEI1: I am ready to do anything to be an internet-based entrepreneur.  
CEI2: My professional goal is to become an internet-based entrepreneur.  
CEI3: I will make every effort to start and run my own internet-based business.  
CEI4: I am determined to create an internet-based business in the future.  
CEI5: I have very seriously thought of starting an internet-based business.  
CEI6: I have the strong intention to start an internet-based business someday. |
| **Entrepreneurial Knowledge (Roy et al., 2017)** | EK1: To what extent do you understand the activity of a cyber-entrepreneur?  
EK2: To what extent you can differentiate between good or bad cyber-entrepreneurs?  
EK3: To what extent do you aware about the activities of e-business association Malaysia?  
EK4: To what extent do you know how business support bodies can help you to get loan and technical aid to start your internet-based business?  
EK5: To what extent do you know about specific training provided for cyber-entrepreneurs? |
| **Subjective Norm (Roy et al., 2017)** | SN1: If I were to start my own internet-based business, my parents would be supportive.  
SN2: If I were to start my own internet-based business, close friends of mine would be very supportive.  
SN3: My parents’ opinions are not at all important to me*.  
SN4: How important are the opinions of your close friends to you? |
| **Attitude towards entrepreneurship (Shahab et al., 2019)** | ATE1: A career as a cyber-entrepreneur is totally unattractive to me.  
ATE2: If I had the opportunity and resources, I would like to start an internet-based business.  
ATE3: Amongs various options, I would rather be anything but a cyber-entrepreneur.  
ATE4: Being a cyber-entrepreneur would provide me great satisfaction.  
ATE5: Being a cyber-entrepreneur implies more advantages than disadvantages to me. |
| **Entrepreneurial self-efficacy (Burnette et al., 2019)** | ESE1: I am confident in my ability to successfully perform the various roles and tasks of cyber-entrepreneurship.  
ESE2: I am confident in my ability to successfully identify new internet-based business opportunities.  
ESE3: I am confident in my ability to create new products.  
ESE4: I am confident in my ability to think creatively.  
ESE5: I am confident in my ability to successfully commercialize an idea or new development. |
| Construct (references)                                      | Items                                                                 |
|-----------------------------------------------------------|----------------------------------------------------------------------|
| Entrepreneurial Orientation (Langkamp Bolton & Lane, 2012)| EO1: I like to take bold action by venturing into the unknown.       |
|                                                           | EO2: I am willing to invest a lot of time and/or money on something that might yield a high return. |
|                                                           | EO3: I tend to act “boldly” in situations where risk is involved.    |
|                                                           | EO4: I often like to try new and unusual activities that are not typical, and not necessarily risky. |
|                                                           | EO5: In general, I prefer a strong emphasis on unique, one-of-a-kind approaches, rather than revisiting tried and true ones previously used. |
|                                                           | EO6: I prefer to try my own unique way when learning new things rather than doing it like everyone else does. |
|                                                           | EO7: I favour experimentation and original approaches to problem solving rather than using methods others generally use for solving their problems. |
|                                                           | EO8: I usually act in anticipation of future problems, needs, or changes |
|                                                           | EO9: I tend to plan ahead on projects.                                |
|                                                           | EO10: I prefer to “step-up” and get things going on projects rather than sit and wait for someone else to do it. |
| Entrepreneurial Creativity (Shahab et al., 2019)          | EC1: I am a very creative person.                                    |
|                                                           | EC2: I set aside a few minutes each day or week to be creative.      |
|                                                           | EC3: I have plenty of ideas.                                         |
|                                                           | EC4: I search for new solutions even when they are not needed.       |
|                                                           | EC5: My ideas are often very original.                               |
|                                                           | EC6: I am sensitive to problems that others cannot see.              |
|                                                           | EC7: It is easy for me to find proposals for improvement.             |
| Personal Innovativeness in Technology (Dutta et al., 2015)| PIT1: If I hear about a new information technology, I would look for ways to try it. |
|                                                           | PIT 2: Among my peers, I am usually the first to try out new information technologies. |
|                                                           | PIT 3: In general, I am hesitant to try out new information technologies. |
|                                                           | PIT 4: I like to try out new information technologies.                |
| Opportunity Recognition (Zhang et al., 2020)              | OR1: I frequently identify opportunities to start-up new internet-based businesses. |
|                                                           | OR2: I frequently identify ideas that can be converted into new products or services. |
|                                                           | OR3: I generally have ideas that may materialize into profitable enterprises. |

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**Declarations**

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