RESEARCH ARTICLE

Measuring and Validating Innovation Self-Efficacy: The Case of Business Management Students

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Abstract: The research adapted an innovation self-efficacy scale that is designed for engineering students and applied it to Filipino business management college students. This paper describes the process of the adaptation, development, and determination of the representative questions per construct using confirmatory factor analysis (CFA). Furthermore, post hoc analyses using Levine's test of homogeneity and one-way analysis of variance (ANOVA) were employed to determine the relationships of the research variables to the demographic profiles of business students. Results show that business management students exhibit moderate degrees of self-efficacy. The measurement model shows that while *Associational Thinking* is the most observed trait, *Observing* is the most critical factor that defines what innovation self-efficacy should be. Post hoc analyses show that respondents being homogenous or heterogenous have no bearing on the ultimate effects of the demographic variables towards the main research variables. Lastly, the research was successful in confirming the entire measurement model with a contextually different dataset that can be easily deployed and combined with other scales or items of interest. Several theoretical and practical implications were presented, and some directions for future research were identified.

Keywords: Innovation, Entrepreneurship, Innovation Self-Efficacy, Business Students, Management Students, Philippines

Amidst rapidly changing global environment and technological developments, innovation and entrepreneurship enable economic growth and development (Carree & Thurik, 2010) by facilitating the creation of new products and services and competition (Carree & Thurik, 2010; Vivarelli 2013; Wong et al., 2005). Lumpkin and Dess (1996) argued that the act of launching a new venture thru a start-up firm is the dominant idea underlying entrepreneurship and is the most relevant factor linking entrepreneurship to economic growth. Summarizing the relationship between innovation and entrepreneurship, Drucker (1985) maintained that entrepreneurs innovate, and that innovation is the specific instrument of entrepreneurship. Innovative entrepreneurs are the backbone of industries because they come up with novel business ideas that will potentially contribute to economic growth thru productivity growth and job

creation, thereby expanding the variety of decisions geared toward profit maximization.

One way to achieve economic growth via the entrepreneurship route is to encourage innovative entrepreneurial behavior. New businesses created by university students and graduates are a powerful tool to bring new knowledge to the market, primarily thru new products, services, process improvements, and business model innovation in both international and local markets (Lane, 2021; Reyes, 2018; "Student entrepreneurs showcase innovative ideas," 2019; Top 10 of Asia, 2019). The Department of Trade and Industry (DTI) has indicated that it is foreseeing a younger pool of entrepreneurs catering to an equally younger market, matching the rising numbers of younger populations ("DTI sees rise of young Filipino entrepreneurs," 2019). Furthermore, 64% of the founders of start-ups in the Philippines are below 36 years of age, with 16% having ages below 25 years of age (PwC, 2020). As more students, and young Filipinos in general, exhibit entrepreneurial skills and tendencies, there is a need to know and understand how they see themselves as innovators, their orientation to innovation, and their confidence to innovate, among others. Understanding these characteristics will guide policymakers in designing courses and programs that promote innovative mindsets especially geared towards ensuring that the link between education and the industry, which are important elements of an innovation ecosystem, stays relevant and essential (Gilmartin et al., 2017).

Innovation is a primary driver of economic growth (Schumpeter, 1942) that involves the commercialization of a firm's offering (Schumpeter, 1911/1934). It is important to recognize that innovation involves the process of implementing a novel idea, which is embodied in the product, that must be adopted by its target market or users (Damanpour, 1987). All these tasks are well within the realm of business management discipline. Business management graduates greatly engage in innovative activities thru (a) involvement in processes improvement and organizational change activities that develop innovative practices to adapt to changing needs such as digital transformation; (b) involvement in the introduction of new products and services thru creative marketing strategies, new ways of interacting with customers, and collaboration with business networks; (c) involvement in translating social science research insights into more operational industry needs; and (d) possession of soft skills like creative and critical thinking, and the ability to identify and articulate on new opportunities (Paunov et al., 2017). Many start-up founders also possess business management degrees (PwC, 2017). Extant literature shows differences between the technical and business management disciplines, especially in the related fields of innovation, entrepreneurship, and creativity (Chan & Fong, 2018; Herman & Stefanescu, 2017; Maresch et al., 2016; Murugesan & Jayavelu, 2015; Pretheeba, 2014; Wagner, 2011). Although the two fields do work together on several instances of innovation, the engineering discipline is primarily involved in the product and manufacturing process design stages, while business management deals with the commercialization stage (Schilling, 2020).

This research adapted the innovation self-efficacy scale of Schar et al. (2017) for use with selected Filipino business management college students. The original scale was primarily used with engineering students, and the measurement proponents themselves have noted that their initial findings have several limitations, starting with their use of undergraduate engineering students, and hence should be expanded to other snapshots of the realities involving innovation and entrepreneurship education (Schar et al., 2017). To address these gaps and to adhere to academic principles of research rigor and relevance, similar innovation self-efficacy measurements presently used in engineering students should also be tested in other fields of discipline that significantly to innovation and entrepreneurship activities, such as business management.

Hence, the following research objectives for this study are:

RO1: To test and reinforce the robustness of the original scale by applying it to a different context in the form of management students.

RO2: To identify which of the five adopted ISE factors contribute most significantly to the formation of innovation self-efficacy.

To our knowledge, the innovation self-efficacy of business management students has not been explored before. Furthermore, this is also the first attempt to explore innovation self-efficacy in the context of an emerging nation like the Philippines, contributing to this research, which to the best of our knowledge, is limited at this time. Most of the published literature related to student entrepreneurship and innovativeness

are focused on entrepreneurial intentions, interests and characteristics, and their relationships, especially in the case of entrepreneurship research in the Philippines (Cruz, 2018; Figueroa et al., 2017; Lai et al., 2017; Mendoza & Lacap 2015; Tan, Yap, & Vicente, 2021).

The rest of this paper is structured as follows: (a) the review of related literature will briefly discuss the related concepts of innovation and entrepreneurship, give an overview of entrepreneurship in the Philippines, and discuss the concept of innovation-self-efficacy; (b) aside from describing the data collection and samples, the methodology will discuss the instruments that were adopted for, and the statistical analyses that were employed in the research; (c) the analysis and results will present the respondent demographics, the general results of innovation self-efficacy measurements for business management students, the representative question item per construct using confirmatory factor analysis (CFA), and relationship of these items to the demographic data of business management students via posthoc analyses; (d) the results of the analysis will be interpreted and discussed in detail, and both theoretical and practical implications are provided; (e) a brief conclusion to summarize results is presented; and lastly, (f) some directions for future research are suggested.

Literature Review

Innovation and Entrepreneurship

A seminal development that led to the present-day understanding of innovation was made by Schumpeter (1911/1934) when he defined innovation (termed "new combinations") as the commercial or industrial application of something new, and may fall under any of these types: (a) introduction of a new good, something that consumers are not yet familiar with, or of a new quality of a good; (b) introduction of a new method of production, one that is not necessarily based on a new scientific discovery; (c) opening of a new market where the firm has not previously entered, whether or not this market has existed before; (d) acquisition of a new source of supply of raw materials or semi-finished goods, regardless whether this source already existed or not; and (e) carrying out of new industry structures, such as the creation or destruction of a monopoly position. Innovation is an engine of economic growth and a "process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one" (Schumpeter, 1942, p. 83). Farr and Ford (1990) defined innovation as the intentional introduction within a person's work role of new and useful ideas, processes, products, or services.

On the other hand, entrepreneurship is generally associated with the creation and running of new enterprises, and it involves the discovery and exploitation of opportunities through the development of new products, new processes, new sources of supply, and new markets (Rodrigues, 2018). Hence its close theoretical and practical links to innovation. Entrepreneurship is about the behavioral characteristic of an individual: the individual's ability and willingness to perceive and create new economic opportunities and to realize these ideas in the market despite uncertainty and other obstacles, and other constraints (Carree & Thurik, 2010). Entrepreneurship plays an important role in economic growth. Empirical evidence shows that the creation of new ventures exerts a positive influence on economic growth in developed countries thru three main modes: (a) knowledge spillovers; (b) increased competition brought about by the increase in the number of enterprises; and (c) increased diversity because entrepreneurship increases the variety of enterprises and hence the variety of goods and services offered in an economy (Audretsch & Keilbach, 2004; Hessels & van Stel, 2011; van Stel, 2006).

Entrepreneurship in the Philippines

There are more than one million business enterprises operating in the country as of 2019; of these, more than 99.5% are classified as micro, small, and medium enterprises (MSMEs), including around 500 to 1,000 active start-ups (Abad, 2021; PwC, 2017). Many of these MSMEs (202,011 or 20.2% of the total) are in the National Capital Region (NCR). As of 2019, MSMEs account for more than 60% of the country's total employment (over 5.5 million jobs) but less than 40% of GVA (Department of Trade and Industry, n.d.). Clearly, MSMEs have the potential to contribute more to GVA and provide more employment. On the other hand, DTI reported that it foresees a younger pool of entrepreneurs catering to an equally younger market, matching the rising numbers of younger populations ("DTI sees rise of young Filipino entrepreneurs," 2019). Furthermore, 64% of the founders of start-ups in the Philippines are below 36 years of age, with 16%

having ages below 25 years of age (PwC, 2020). As more students, and young Filipinos in general, exhibit entrepreneurial skills and tendencies, there is a need to know and understand how they see themselves as innovators, their orientation to innovation, and their confidence to innovate, among others. And as these students are still in school, it is a ripe opportunity for them to learn more about innovation and entrepreneurial skills and tendencies in this formal learning environment.

However, although the Philippines registered the highest new business rate among Asian countries, it also recorded the highest business discontinuance rate in the region. The Philippines' 12.2% discontinuance rate is more than 2.6 times that of the 4.6% Asian average, which was primarily due to poor business performance and profitability in saturated markets (Velasco et al., 2017). It has been suggested that to overcome such challenges, innovative activities that bring about improvements in products and processes must be made. This involves innovative activities that bring about improvements in products, manufacturing, and business processes. A study reported that less than 20% were successful enterprise upgraders (Hampel-Milagrosa, 2014). Albert et al. (2018) also reported that less than half of approximately 900 responding firms in a study have engaged in at least one innovation-related activity, but MSMEs are less likely to engage in innovation-related activities. Reeg (2013) highlighted that most entrepreneurs in less developed and developing countries primarily engage in creative imitation, wherein businesses imitate the products and production processes that have been invented elsewhere in the world. In the Philippines, innovation is often not about something new to the world but something new to society (Quimba et al., 2017).

It is thus necessary for Philippine MSMEs and entrepreneurs to have an innovative orientation to survive competition, especially during the pandemic, or to get ahead of the competition in general. The entrepreneur is the main innovator, whose main function is to allocate existing resources to new uses and "new combinations" (Schumpeter, 1934, p. 66). Drucker (1985) maintained that entrepreneurs innovate, and that innovation is the specific instrument of entrepreneurship. Prior studies show that innovation is an important factor in sustaining firm performance (Damanpour & Gopalakrishnan, 2001; De Clercq et al., 2010; Droge et al., 2008; Hampel-Milagrosa, 2014, Prajogo, 2006; Subramanian & Nilakanta,1996). For this to be better achieved, how individuals can be taught, trained, and oriented utilizing a more structured approach to become more innovative in their entrepreneurial ventures deserve renewed and closer scrutiny.

Innovation Self-Efficacy

As observed in the previous discussions, the growing complexity and the intensifying challenges of innovation and entrepreneurship require a deeper and more scholarly approach to how individuals can be better equipped. A number of interesting academic attempts have been previously made to create some structured approach to how innovation and entrepreneurship can be developed, many of which trace their theoretical underpinnings to the seminal works of Bandura (1977, 1986, 1997) on self-efficacy. Bandura's (1986) social cognitive theory hypothesizes that an individual can exercise control over their thoughts, feelings, motivation, and actions thru their self-system. This self-system provides reference mechanisms and a set of subfunctions that are used to perceive, regulate, and evaluate behavior, which results from the interaction between the system and environmental sources of influence. External factors such as economic conditions, socioeconomic status, and educational and familial structures affect human behavior to the degree that these factors influence people's aspirations, self-efficacy beliefs, personal standards, emotional states, and other self-regulatory influences (Pajares, 2002).

Perceived self-efficacy is, therefore, a person's judgment of their own capabilities to organize and execute actions to produce designated levels of performance that exert influence over events that affect their lives (Bandura, 1994), and the extent of a person's belief in his own ability to complete tasks and reach goals (Bandura 1977, 1997). Hence, people with high assurances in their capabilities view difficult tasks as challenges that they can overcome. They set challenging goals, maintain a strong commitment to these goals, and give sustained efforts even in the face of failure. In the context of this research, Schar et al. (2017), citing Bandura (1982) and Bandura (2001), specified that (a) perceived self-efficacy beliefs can vary depending on situational considerations, such as within or outside of a domain of expertise and

the circumstances surrounding the occurrence of behavior and (b) perceived self-efficacy is agentic: the intention to make things happen by one's action makes it particularly relevant in the pursuit of career goals.

Extending Bandura's conceptual arguments to this research context, innovation self-efficacy (ISE) is an individual's belief in their ability to accomplish tasks necessary to do innovative work (Gerber et al., 2012), like novel market offerings (products and services), improved process design, or even new business models. A potential innovative entrepreneur's work involves a lot of uncertainty. This person must connect different ideas from different disciplines and often limited information amid ambiguous problems, failures, and uncertainty. This person's work involves the discovery and exploitation of opportunities, the search for creative solutions, and working under awful resource constraints (Roy et al., 2017). Hence, an aspiring innovative entrepreneur may not engage or persist in innovative efforts if they do not believe in their abilities. The uncertainty that is entwined with the very nature of innovation requires a high level of persistence to overcome ambiguous problems and failures. Because self-efficacy affects life choices, levels of motivation, quality of functioning, resilience to adversity, and vulnerability to stress and depression (Bandura, 1994), a strong sense of efficacy enables an entrepreneur to sustain perseverance and effort to succeed. Positive self-efficacy beliefs are tied to persistence and have the potential to influence innovation by strengthening creative performance, increasing the tendency to engage in expended effort, and inducing learning from failure (Amabile, 1996; Gerber et al., 2012, Pajares, 1996; Redmond et al., 1993).

The set of measurements, as proposed by Schar et al. (2017), has five constructs: Questioning (QU), Observing (OB), Experimenting (EX), Idea Networking (IN), and Associational Thinking (AT). Bandura (2006) explained that a self-efficacy scale must be adapted to the selected activity domain and must be able to evaluate the multifaceted ways in which efficacy beliefs operate within this domain of interest: it must be linked to factors that determine the quality of functioning in this domain. In this study, the *activity domain* of interest is that of entrepreneurship and innovation, both of which have strong links to business and management. Below is the summary of the measures:

- *Questioning (QU) (6 items)*: Confidence in challenging the status quo and asking the appropriate questions to have creative insights on different things
- *Observing (OB) (4 items)*: Confidence in watching how the things around a person work, and how people react to their respective environments, often finding opportunities in the process
- *Experimenting (EX) (5 items)*: Confidence in engaging in new experiences and taking apart products and processes to get new data that can trigger a novel idea
- *Idea Networking (IN) (4 items)*: Confidence in interacting with a network of people with diverse backgrounds to generate different knowledge and trigger new ideas
- *Associational Thinking (AT) (2 items)*: Confidence in one's ability to successfully connect seemingly unrelated questions, problems, or ideas from different fields

Based on Bandura's reasoning (1986, 1994), having strong self-efficacy beliefs in the aforementioned skills will enhance entrepreneurs' accomplishments by influencing the choices they make and the alternatives they pursue. Entrepreneurs with high strong self-efficacy supported by these five posited skills are incentivized to engage in innovative tasks. Dyer et al. (2009) argued the following: (a) with Questioning, they will be comfortable challenging the status quo, playing devil's advocate, and imposing constraints on their thinking that will serve as a catalyst for out-of-the-box insights; (b) with Observing, they will be ready to learn small behavioral details about customers, suppliers, and other companies that can provide insight for new product ideas; (c) with Experimenting, they will be confident in trying out and refining novel ideas before they are productized; (d) with Idea Networking, they will be confident and comfortable in meeting people with different kinds of ideas and perspectives to extend their own knowledge domains and learn new ideas in the process; and (e) with Associational Thinking, they will be confident that they can connect seemingly unrelated questions, problems, or ideas from different fields that they gathered using the four previous skills. The higher their sense of efficacy, the greater the effort, persistence, and resilience (Pajares, 2002), and they will exhibit greater intrinsic interest and inclination

(Bandura, 1994) in innovative activities. Furthermore, because self-efficacy beliefs also influence thought patterns and emotional reactions, entrepreneurs with high self-efficacy will be in a better position to handle the demands of innovation (Pajares, 2002).

Methodology

Data Collection and Sample

Convenience sampling was employed to determine the respondent base. Furthermore, the actual survey was carried out via paper-based dissemination, conducting face-to-face survey interviews. The field survey garnered a total of 427 business management students enrolled in public and private universities in the Greater Manila Area (GMA). The respondents were at least of junior standing in their respective courses at the time of the survey. The number of respondents is comparable to previous researches. Schar et al. (2017) had 334 respondents for Study 1 and 110 respondents for Study 2, whereas Dyer et al. (2008) had 512 respondents. In addition, Roscoe (1975, as cited in Sekaran & Bougie, 2003) mentioned that for quantitative research involving survey data and multivariate analysis, sample sizes larger than 30 but less than 500 is the standard rule of thumb for sample size adequacy. Furthermore, Roscoe (1975, as cited in Sekaran & Bougie, 2003) also noted that for multivariate research, the sample size should be approximately 10 times as large as the number of variables in the study. Following these rules of thumb, there are five main variables and a total of 21 question items in this present research. Therefore, the sample size for this research is well above the recommended number, estimated to be somewhere between 50 and 210.

Instruments and Measures

The survey is divided into two major sections. The first section asked for the respondents' demographic information, such as age, gender at birth, family income/socioeconomic status, university type (public or private), and academic standing (junior or senior).

The second section measured the main variables of ISE. This study adapted the innovation self-efficacy scale of Schar et al. (2017) for use with selected Filipino business and management college students. Although this scale was initially developed for engineering students, we adapted this for business management students because (a) Dyer et al.'s (2008) scale, the basis of Schar et al.'s (2017) work, was constructed ground up in collaboration with innovative entrepreneurs and business managers/executives of different academic backgrounds; and (b) the statements of scale are appliable to business management college students as well. In fact, the self-efficacy of a student related to doing innovative activities (e.g., introduction of new products/services or process improvement) are associated with business management.

In adapting the scale for this study, a few minor modifications were made. First, the scale was changed from a 5-point Likert scale to a 7-point Likert scale, ranging from not confident (1) to extremely confident (7). Second, the statements were translated into Filipino to provide a better context to the statements and for the convenience of respondents who may not be well-versed in the English language.

Analysis and Results

Respondent Demographics

Out of the 427 valid respondents from business schools for this research, a little over half (53.6%) are female. Most are aged 20 to 24 years old (82.4%) and are in at least their senior standing according to their respective curriculum (74.7%). There is also an almost even split between those who are in a public university (51.8%) vs. in a private university (48.2%). (See Table 1: Respondent demographics)

Table 1

Respondent Demographics

	N = 427	%
Gender at birth		
Male	198	46.4
Female	229	53.6
Age group (in years old)		
15 to 19	75	17.6
20 to 24	352	82.4
University type		
Public university	221	51.8
Private university	206	48.2
Academic standing		
Senior standing	319	74.7
Junior standing	108	25.3

Descriptives, Validity, and Reliability

Confirmatory factor analysis (CFA) via AMOS statistical software was employed to develop and analyze the measurement model. Due to the focus of this research, CFA was carried out in two steps: A first-order CFA to determine the validity and reliability of the respective measurement items of the five identified factors of Innovation Self-Efficacy, and then a second-order CFA to determine the validity and reliability of each of these five factors towards Innovation Self-Efficacy. The reason for conducting this form of CFA is that, as Schar et al. (2017) had developed and argued, the concept of Innovation Self-Efficacy is a multidimensional construct consisting of five unique but correlated factors of Questioning, Observing, Experimenting, Idea Networking, and Associational

Table 2

First-Order CFA Results

Item	Statement	Mean	Std. Dev.	Std. Loading
	Questioning (QU)			
QU4	Ask the kind of questions that change the way others think about a problem	5.016	1.292	0.773
QU5	Ask questions that challenge fundamental assumptions	4.904	1.328	0.764
QU6	Ask questions to understand why projects or designs underperform	5.241	1.278	0.691
QU2	Ask the right questions to get to the root of a problem	5.248	1.254	0.662
QU1	Ask a lot of questions	5.098	1.325	Deleted
QU3	Ask more questions than my classmates	4.248	1.479	Deleted
	Observing (OB)			
OB3	Observe how people use products and services to help me get new ideas	5.422	1.181	0.813
OB1	Think of new ideas by carefully watching people interact with products and services	5.321	1.225	0.791
OB2	Generate new ideas by observing the world	5.295	1.184	0.775
OB4	Pay attention to everyday experiences as a way to get new ideas	5.475	1.217	0.746
	Experimenting (EX)			
EX2	Experiment to create new ways of doing things	5.148	1.256	0.840
EX1	Experiment as a way to understand how things work	5.326	1.208	0.793
EX4	Actively search for new ideas through experimenting	5.136	1.212	0.789
EX3	Be adventurous and seek out new experiences	5.417	1.267	0.665
EX5	Take things apart to see how they work	4.967	1.377	0.657
	Idea Networking (IN)			
IN4	Build a large network of contacts with whom I can interact with to get ideas for new products or services	5.253	1.349	0.849
IN3	Reach out to people outside of my academic major to spark ideas for a new product or service	5.309	1.382	0.803
IN2	Seek the advice of students and faculty outside my circle of contacts to test ideas	5.225	1.324	0.798
IN1	Build a network of people whom I trust to bring a new perspective and refine my ideas	5.436	1.264	0.696
	Associational Thinking (AT)			
AT2	Connect ideas from different and diverse areas	5.499	1.114	0.864
AT1	Connect concepts and ideas that appear, at first glance, to be unconnected	5.340	1.121	0.819

Thinking, each having its own set of measurement items. In cases where a concept is theorized to be multidimensional such as this, Marsh and Hocevar (1988) recommended applying second-order factor analysis to dissect this multidimensionality and determine the degree of uniqueness and correlation of each of the theorized dimensions and their respective implications to the overall concept.

The resulting CFA measurement model showed acceptable model fit (CMIN/DF=2.072; GFI=0.926; AGFI=0.905; RMR=0.073; NFI=0.930; TLI=0.956; CFI=0.962; RMSEA=0.05) based on the rule of thumb numbers (Hair et al., 2010). For the first-order CFA, only two items on Questioning were deleted due to low standardized loading (see Table 2), and all five factors had sufficient standardized loadings toward Innovation Self-Efficacy (see Table 3).

Furthermore, as shown in Table 4, this measurement model achieved good convergent and discriminant validity (Average variance extracted (AVE) > 0.50; square root of AVE > correlation coefficients), and good reliability (Cronbach α > 0.70; Composite reliability (CR) > 0.70). These all indicate that this measurement model has enough validity and reliability to proceed with interpretations and discussions relevant to the research context.

The first-order CFA results already yield some interesting initial insights. The means indicate how much the respondents agreed or disagreed with each of the survey question items, reflecting what they most commonly observe within the context of each factor contributing to developing Innovation Self-Efficacy. On the other hand, the standardized loadings indicate what the respondents think is the most critical question item defining each of these five factors. In other words, these comparisons of means and standardized loadings describe the current scenario highlighting the gaps between what the respondents currently experience vs. what they think is actually needed for them to develop Innovation Self-Efficacy. For Questioning, the most commonly observed trait is the ability to ask the right questions to get to the root of a problem (QU2). In other words, QU2 has the highest mean among the items under the factor Questioning. However, what is critical is the ability to ask the kind of questions that change the way people think about a problem (QU4). As shown in the CFA results, QU4 has the highest standardized

Table 3

Second-Order CFA Results

	Mean	Std. Dev.	Std. Loading
Innovation Self-Efficacy			
Observing (OB)	5.378	1.011	0.830
Questioning (QU)	5.102	1.029	0.748
Associational Thinking (AT)	5.419	1.033	0.745
Idea Networking (IN)	5.306	1.121	0.738
Experimenting (EX)	5.199	1.014	0.719

Table 4

Validity, Reliability, and Correlation Matrix With the Square Root of the AVE on the Diagonal

	Cronbach α	CR	AVE	QU	OB	EX	IN	AT
QU	0.810	0.814	0.524	**0.724**				
OB	0.862	0.863	0.611	0.606	**0.782**			
EX	0.861	0.866	0.566	0.561	0.628	**0.752**		
IN	0.864	0.867	0.622	0.524	0.599	0.529	**0.788**	
AT	0.829	0.829	0.709	0.581	0.614	0.466	0.599	**0.842**

loading among the items under Questioning. Hence, following the same approach, for Observing, the ability to pay attention to everyday experiences as a way to get new ideas is the most commonly noted trait (OB4), but what is critical for this variable is the ability to observe how people use products and service to help get new ideas (OB3). For Experimenting, the capability to be adventurous and seek out new experiences is what is highly visible and most commonly perceived (EX3). But on the other hand, experimenting to create new ways of doing things (EX2) is the critical trait describing this variable. For Idea Networking, building a network of trusted people to bring a new perspective and refine ideas (IN1) is the most observed trait, but building a large network of contact to interact with to get ideas for new products or services (IN4) is what is critical for this variable. Lastly, for Associational Thinking, connecting ideas from different diverse areas (AT2) proved to be both the most observed and critical trait.

The second-order CFA results also provide some interesting insights. As mentioned by Marsh and Hocevar (1988), one of the main objectives of conducting this second-order CFA is to examine and evaluate the theorized factors of a multidimensional construct. The measurement model shows that, based on the means, the ability to exhibit Associational Thinking is the most commonly observed trait. However, the results also show that, based on the standardized loadings, Observing is the most critical factor that defines what Innovation Self-Efficacy should be. Hence, it is clear that there are gaps as to what respondents currently experience vs. what they think is actually important in developing Innovation Self-Efficacy. These gaps, as shared by the respondents, provide interesting talking points for further theoretical and practical considerations.

Post Hoc Analysis

Recognizing some practical implications in identifying and evaluating how Innovation Self-Efficacy can be developed that can also be derived from this research, some post hoc analyses were also conducted. As previously mentioned, some internal and individual characteristics such as personal and educational backgrounds and orientations may influence one's perceptions in learning innovation and entrepreneurship (Schar et al., 2017), and even in learning and developing self-efficacy in general (Bandura, 1977, 1986, 1997). Furthermore, because the research context touches on the educational environment, possible institution-related factors may also play a role (Cerdeira et al., 2018; Eigbiremolen et al., 2020). Hence, to test for possible statistically significant influences of these other factors involving certain respondent demographics, as pointed out by previous research, Levine's test of homogeneity and one-way analysis of variance (ANOVA) via SPSS statistical software were employed for these posthoc analyses (see Table 5).

Table 5

Levine's Test of Homogeneity and One-Way ANOVA

	Gender	Age	University Type	Academic Standing
Levine's test of homogeneity				
QU	0.186(n.s.)	3.662(n.s.)	3.658(n.s.)	1.296(n.s.)
OB	4.590*	1.963(n.s.)	0.017(n.s.)	4.176*
EX	1.379(n.s.)	0.387(n.s.)	8.264**	0.896(n.s.)
IN	2.120(n.s.)	0.079(n.s.)	0.538(n.s.)	0.037(n.s.)
AT	4.729*	0.572(n.s.)	0.064(n.s.)	0.062(n.s.)
One-way ANOVA				
QU	0.715(n.s.)	0.005(n.s.)	0.479(n.s.)	0.833(n.s.)
OB	2.719(n.s.)	5.864*	0.312(n.s.)	2.439(n.s.)
EX	0.111(n.s.)	0.440(n.s.)	1.718(n.s.)	2.155(n.s.)
IN	0.030(n.s.)	0.690(n.s.)	8.801**	0.002(n.s.)
AT	1.494(n.s.)	2.399(n.s.)	2.021(n.s.)	0.457(n.s.)

The results of Levine's test show that the data is mostly homogeneous across the four demographic variables included in this research, with a few exceptions. For Observing, there is some degree of heterogeneity in the responses between males (M_{male}=5.2917; SD_{male}=1.1083) and females (M_{female}= 5.4531; SD_{female}= 0.9136) and between senior standing (M_{senior}=5.3339; SD_{senior}=1.0550) and junior standing (M_{junior}= 5.5093; SD_{junior}= 0.8572) students. There is also some degree of heterogeneity between males (M_{male}= 5.3535; SD_{male}= 1.1293) and females (M_{female}= 5.4760; SD_{female}= 0.9404) in their perceptions of Associational Thinking. But the most interesting finding here is the stronger degree of heterogeneity between public (M_{public}=5.2606; SD_{public}= 0.9108) and private ($M_{private}$= 5.1320; $SD_{private}$= 1.1126) university students in terms of Experimenting.

Most ANOVA results show no statistically significant effects of the demographic variables on the main research variables. However, of note here are the statistically significant effect of age (M_{15to19}= 5.6333; SD_{15to19}= 0.9312 vs. M_{20to24}= 5.3239; SD_{20to24}= 1.0197) towards Observing, and of university type (M_{public}=5.1516; SD_{public}=1.1385 vs. $M_{private}$= 5.4709; $SD_{private}$= 1.0813) towards Idea Networking.

These post hoc analyses imply that respondents being homogenous or heterogenous have little bearing on the ultimate effects of the demographic variables towards the main research variables. In other words, the degree of diversity of management students learning innovation and entrepreneurship may not be too much of a concern in developing their innovation self-efficacy across all five of these factors, save for a few. As seen here, despite the data being homogenous on Observing, the ANOVA results imply that different age groups can produce statistically significantly different perceptions of Observing. The same is true with the university type. Being in a public or private university significantly matters on perceptions of Idea Networking. These additional insights provide more practical bases for strategizing the approach to developing Innovation Self-Efficacy, depending on the target audience's demographics. More of these are discussed in the conclusions section of this research.

Discussion

Reiterating the salient points in the discussion on Innovation Self-Efficacy in the context of entrepreneurship, an entrepreneur exerts significant influence on the direction of his or her business endeavor (Mead, 1994; Reeg, 2013). This influence is developed through the entrepreneur's two broad sets of factors. The first is their education, related business training and seminars, proactive search for relevant information, intangible characteristics such as motivation to succeed personally and financially, vision and long-term goals, and the drive to work intensively and productively. The second is their personal and professional networks in the enterprise. In addition, Quimba and Rosellon (2019) observed a similar set of factors influencing the innovation capability and activities of MSMEs. There are internal factors that include the characteristics and skills of the entrepreneur, the organizational and innovation culture, the learning process and capability, among others. On the other hand, external factors include network integration and university/research institution linkages. Hence, for innovation to thrive in entrepreneurship, there must be a favorable development of these necessary internal and external factors. Thus, this research contends that an empirically-supported measurement model framing these sentiments is necessary to ensure that, indeed, entrepreneurs are developing the appropriate set of skills and capabilities necessary for the development of their businesses. Furthering the previous efforts such as that of Dyer et al. (2008) and Schar et al. (2017), this research adopts the multidimensional Innovation Self-Efficacy scale, consisting of five factors of Questioning, Observing, Experimenting, Idea Networking, and Associational Thinking to further test its robustness in a different context.

To this end, and through an exhaustive discussion of the related and relevant literature and a rigorous statistical process to generate empirical results, this research complements and strengthens previous efforts to come up with a measurement model to determine an individual's Innovation Self-Efficacy. To reiterate, this research contributes to previous efforts on developing a theoretical link between the broader understanding on self-efficacy as theorized by Bandura (1982, 1986, 2001) and the measurement scales refined by Schar et al. (2017) based on the prior work of Dyer et al. (2008). The use of a two-stage CFA to generate first-order and second-order results and the use of a different context to apply and analyze the proposed measurement scales further added to its robustness. Hence, this research expands the purview of this

context by additionally providing empirical evidence that all five factors formulated by Schar et al. (2017) have enough statistical strength to directly define what Innovation Self-Efficacy should be. The results show that Observing is the most important factor to consider in developing Innovation Self-Efficacy, followed by, in the order of their respective standardized loadings, Questioning, Associational Thinking, Idea Networking, and Experimenting.

The results provide evidence that in general, the students have a moderate degree of self-efficacy. This is important because these business management students were either junior or senior students in standing during the survey. It is desirable that these potential entrepreneurs have some degree of innovation self-efficacy when they graduate and join an enterprise or start their own. Some of them may already be engaged in some form of business. Self-efficacy is related to a person's confidence in his ability to evaluate and find a feasible solution to a problem and achieve his objective. A person with high innovation self-efficacy will trust his judgment on certain ideas that may be different from those of the majority. Hence, self-efficacy mediates between the idea and the desired outcome. This is important in the field of innovation management because not all creative ideas are translated into feasible and profitable products, services, or processes. High self-efficacy will enable a person to exert more effort and try to overcome the problems that they will meet along the way during the development process. This person will not be daunted by the criticisms and failures from their environment, especially from their peers and competitors.

All five factors theorized in this research proved to be statistically sound measures of Innovation Self-Efficacy. Out of the five, Observing and Associational Thinking are two factors that provide the most interesting insights into the development of one's Innovation Self-Efficacy. The results show that Observing is the most empirically powerful among the five within the measurement model. Entrepreneurship involves the process of discovery, evaluation, and exploitation of opportunities that result in the creation of goods and services (Shane & Venkataraman, 2000). Furthermore, Dyer et al. (2008) showed that innovative entrepreneurs exhibit certain behavioral patterns through which they acquire information that enable them to generate novel ideas for a potentially innovative business. One of these behavioral patterns is Observing, which contributes to the discovery portion of the process. Observing involves engaging multiple senses while carefully watching and analyzing the actions and behaviors of customers, suppliers, and other companies, especially taking note of small behavioral detail that can aid in gaining insights about new ways of doing things (Dyer et al., 2009). But on the more practical side, most experiences lead to Associational Thinking as the one that stands out in the development of Innovation Self-Efficacy. The result of this skill is notable because it is the most important skill that an innovative entrepreneur must have (Dyer et al., 2008). Dyer et al. (2011) illustrated that Associational Thinking is a cognitive skill that involves connecting seemingly unrelated ideas, knowledge, and information from different fields, disciplines, industries, or even geographies that others find unrelated. With this skill, an innovative entrepreneur can come up with breakthrough products and processes. The more frequently an entrepreneur engages in Observing, the more an entrepreneur gets to experience and learn diverse new information and ideas that they try to understand, categorize, and store as new knowledge, and enable their brain to naturally and consistently make, store, and recombine associations more easily. Thus, the diverse experiences resulting from an entrepreneur's Observing skill help build their ability to generate ideas that can be recombined in new ways through Associational Thinking.

Also, this research shows that a number of demographic factors can exert some influence on the development of Innovation Self-Efficacy. The post hoc results show that there are some differences in perceptions of Observing and Associational Thinking between males and females, where females are found to have a better appreciation of these factors. Levine's test of homogeneity shows no statistically significant results to indicate gender bias, which is confirmed by the one-way ANOVA results (Table 5). Although the current research does not exhibit any gender bias, it is recommended that future related research should employ an equal number of male and female respondents.

The differences between public and private universities are noteworthy as well. Students from public universities seem to do better in Experimenting, whereas private university students seem to do better in Idea Networking. The statistically significant difference between the different school types with

respect to these constructs may be explained by the nature of the school, including its culture and its influence on expected behaviors and performance (Cerdeira et al., 2018; Eigbiremolen et al., 2020). On the one hand, most private schools are expected to have more resources at their disposal in coming up with course activities that enhance the different skills. This is especially important in private schools, where students typically have more incentives to participate and are more connected to practical and real-world matters (Eigbiremolen et al., 2020). On the other hand, some schools could also exhibit some degree of conservatism or its opposite, which affects the teaching style of its faculty. Moreover, it is possible that the nature of a school influences the design of its degree offerings (Cerdeira et al., 2018). Hence, given a specific degree like business administration, one can expect certain differences between the offering of a public school from that of a private school. This result is an interesting area of future research.

Lastly, younger and less experienced students tend to exhibit better Observing skills compared to older ones as well. One possible explanation for the statistically significant difference between the age groups for the construct Observing is that older students may be unintentionally using this skill less due to various reasons, and with less usage comes less mastery experience, which is the primary source of self-efficacy (Bandura, 1994). The older students may be using this skill less frequently because (a) they are more comfortable with their degree programs and rely more on accumulated knowledge in different areas, or (b) the inherent designs of the different degree programs unintentionally prevent the consistent use of the skill, or (c) a combination of both. If this "unintentional less usage" assumption is indeed valid, it is necessary to review and adjust the program to provide students with authentic tasks that enable them to apply more frequently knowledge and skills in diverse situations. Nevertheless, this result should be further validated in future research.

On top of the strong empirical support for the theorizing on Innovation Self-Efficacy, the research results found interesting insights into the way individuals get exposed to, learn, and perceive what Innovation Self-Efficacy is and should be. The CFA results show interesting gaps between what is commonly observed (based on the descriptive mean scores) and what should be critical (based on the standardized loadings) for each of the five traits defining Innovation Self-Efficacy.

On Questioning: QU4 ("Ask the kind questions that change the way others think about a problem") is more appropriate than QU2 ("Ask the right questions to get to the root of a problem") because it involves challenging the status quo. Asking the appropriate questions enables a person to have creative insights on different things: an innovator should ask a combination of what is, what caused, why, why not, and what if questions to empathize with current and potential customers/users to understand why things are the way they are. More importantly, he should ask questions that either impose or eliminate constraints and force himself to think out of the box to generate novel ideas (Dyer et al., 2008, 2011).

On Observing: OB3 ("Observe how people use products and services to help me get new ideas") is more appropriate than OB4 ("Pay attention to everyday experiences as a way to get new ideas") because the skill is explicitly associated with how people use products and services. It is important for business students to be able to link their ideas to products and services that are practical to use by their target customers. Observing includes watching how the things around you work or do not work; it involves watching people, processes, companies, or technologies and how current and potential customers/users act and react to their respective environments, often finding opportunities in the process. This skill also involves looking for a solution from one field of study that can be applied, directly or with modification, in a different field of study (Dyer et al., 2008, 2011).

On Experimenting: EX2 ("Experiment to create new ways of doing things") is more appropriate than EX3 ("Be adventurous and seek out new experiences") because even though EX3 involves looking for inspiration for new ideas via new experiences, EX2 involves an end state in mind ("create new ways of doing things") that agrees with the Schumpeterian definition of innovation. Aside from working in laboratories and creating prototypes, Experimenting is engaging in new experiences and taking apart products and processes to get new data that can trigger a novel idea. Experimenting is the best differentiator between innovators and non-innovators, and the best experimenters are those innovators who started new businesses and those who invented new products (Dyer et al., 2008, 2011).

On Idea Networking: IN4 ("Build a large network of contacts with whom I can interact with to get ideas for new products or services") is more appropriate than IN1 ("Build a network of people whom I trust to bring a new perspective and refine my ideas") because like Observing, the skill is explicitly associated with the creation of products and services. Idea Networking involves making an effort to interact with a network of people with diverse backgrounds to generate different knowledge and trigger new ideas. The network should include people from different business functions, companies, industries, countries, socioeconomic groups, age groups, and so forth. Likewise, if faced with a particular problem, one can talk to people within his network who previously faced a similar problem to get their insights (Dyer et al., 2008, 2011). Aside from the entrepreneur-owner's personal characteristics, his network of contacts will have a major impact on the success of enterprise upgrading, which is the qualitative improvements in products, processes, and ways of organizing production, enabling the entrepreneur to capture innovation rents as a result of being faster than the competition (Mead, 1994; Quimba & Rosellon, 2019; Reeg, 2013).

On Associational Thinking: AT2 ("Connect ideas from different and diverse areas") emphasizes that breakthrough ideas and products often happen at the intersection of different disciplines and fields, and this skill enables an innovator to think of new ideas by making connections across seemingly unrelated questions, problems, or ideas (Dyer et al., 2008, 2011).

Given the gap between what is supposed to be developed and the mindset that is cultivated by the junior and senior business students, there is a need to improve the business degree programs of the respective business schools. van Dinther et al. (2011) showed that 80% of the reviewed intervention studies demonstrated a significant relationship between an intervention program and students' self-efficacy. He further argued that educational institutions could help in this endeavor by ensuring that business management students not only have the required skills to innovate, but enough self-efficacy as well. Although competent behavior largely depends on acquiring knowledge and skills, self-efficacy facilitates achievements, motivation, and learning. It is important that educational institutions ensure that students develop self-efficacy. Knowing the factors that affect the development of students' self-efficacy can help these institutions modify educational programs that promote innovative mindsets and enhance the students' self-efficacy. Hence, it is possible to influence students' self-efficacy within an educational program. Therefore, the research results should serve as a means of how both academics and practitioners should perceive Innovation Self-Efficacy and come up with suggestions on how to improve the ways in how individuals wanting to get into innovation and entrepreneurship can learn. Therefore, these results provide support for both theory and practice, as detailed in the following subsections.

Theoretical Implications

The research results lend empirical support to the theorizing and the operationalizing towards developing a measurement model for Innovation Self-Efficacy as first tackled by Dyer et al. (2008) and refined by Schar et al. (2017). In this research, this is theoretically rooted in the more general self-efficacy as espoused by Bandura (1982, 1986, 2001). Overall, all five theorized factors of Questioning, Observing, Experimenting, Idea Networking, and Associational Thinking proved to be sound factors in defining and measuring Innovation Self-Efficacy, further confirming the initial findings of Dyer et al. (2008) and Schar et al. (2017). But beyond that, a more valuable contribution of this research is that not only did these results lend empirical support to these previous works, but it also added to its robustness by providing further confirmation using a different context of business students, as opposed to utilizing engineering students in the previous works. This paves the way for future efforts in the further study and refinement of the Innovation Self-Efficacy variable as a theoretical measurement model.

Furthermore, now that a plausible and empirically-supported measurement model for Innovation Self-Efficacy has been established, this can also now result in many other possibilities on how this particular variable can be introduced to other theoretical models on learning, training, and education involving innovation and entrepreneurship. For instance, because the development of this measurement model has also touched on the sources of self-efficacy as discussed by Bandura (1995), how these five factors of Questioning, Observing, Experimenting, Idea Networking, and Associational Thinking be developed across the different paradigms of mastery experience, vicarious experience, verbal persuasion, and positive physiological and emotional states must

be taken into consideration in these other possible theoretical models on learning, training, and education. To illustrate, Schilling (2018) argued that verbal persuasion is generally effective in increasing self-efficacy, depending on the person's past experiences in a related task or in the interactions with a person he or she can identify with. Secondly, van Dinther et al. (2011) and Schilling (2018) recommended giving encouragement and showing trust in the students' ability to complete the tasks, celebrating students' successes, and tolerating their failures, consistent with fostering positive physiological and emotional states.

Practical Implications

Educational and training institutions would benefit the most from the practical implications borne out of this research. The findings discussed in this research should serve as logical support in the policymaking and the design of courses, programs, and materials aimed at developing Innovation Self-Efficacy. First, the instruction on Innovation Self-Efficacy can revolve around these five areas. The actual measurement scales provide valuable guidance on how to carry out the actual instruction for each particular area, teaching learners how to question, observe, experiment, form networks for ideas, and make associations between different ideas and concepts. For instance, because the research results show that Observing is the most influential of the five factors, this can be the first skill that should be learned. Further referring to the research results, out of the four areas under Observing, learning to observe how people use products and services to help get new ideas can be the first thing to be considered. This can be followed by thinking of new ideas by carefully watching people interact with products and services. Once these are learned, then the instruction can proceed with developing how to generate new ideas by observing the world and paying attention to everyday experiences as a way to get new ideas. Afterward, once the learning on Observing has been completed, the next major step is to develop the skills in Questioning, and so on and so forth. In other words, these CFA results can even aid in designing the actual flow of instruction in developing Innovation Self-Efficacy.

Secondly, some demographic differences, particularly in the type of university—whether it is a public or private one—can play some role in the overall effectiveness of the development of these five Innovation Self-Efficacy factors. On the one hand, private schools are expected to have more resources at their disposal in coming up with course activities that enhance the different skills. On the other hand, some schools could also exhibit some degree of conservatism or its opposite, which affects the teaching style of its faculty. Moreover, it is possible that the nature of a school influences the design of its degree offerings. Hence, given a specific degree like business administration or business management, one can expect certain differences between the offering of a public school from that of a private school.

Conclusion

This study contributes to previous efforts to develop a theoretical link between self-efficacy and the measurement scales refined by Schar et al. (2017) based on the prior work of Dyer et al. (2008). Results show that business management students have a moderate degree of self-efficacy. Employing a two-stage CFA to generate first-order and second-order results and using a different context of business management students, the study provides empirical evidence that all five factors formulated by Schar et al. (2017) have enough statistical strength to directly define what Innovation Self-Efficacy should be: Observing is the most important factor to consider in developing Innovation Self-Efficacy, followed by, in order of their respective standardized loadings, Questioning, Associational Thinking, Idea Networking, and Experimenting. This research found interesting insights on the way individuals get exposed to, learn, and perceive what Innovation Self-Efficacy is and should be, with the CFA results showing interesting gaps between what are commonly observed (based on the descriptive mean scores) and what should be critical (based on the standardized loadings) for each of the five traits defining Innovation Self-Efficacy. This research also shows that several demographic factors can exert some influence on the development of Innovation Self-Efficacy. Post hoc analyses exhibit differences in the following factors: (1) perceptions on Observing and Associational Thinking between males and females; (2) Experimenting and Idea Networking skills between public and private universities; and (3) Observation skills with respect to academic standing. Although this paper discussed possible reasons for the

observed differences, it is recommended that these results should be further validated in future research.

Directions for Future Research

This research utilized business students to establish an empirically-defined measurement model for Innovation Self-Efficacy. Hence, the first and most obvious direction for future research is to further test the robustness of this model by considering other fields of discipline that have some degree of involvement with innovation and entrepreneurship, such as those in the engineering discipline or even those taking graduate degrees such as master's degree in business administration (MBA) or master's degree in an engineering field. As many of these students' experiences in and out of their classes can also deal with any or all of the five theorized and confirmed factors, acquiring their insights on this subject matter will be very valuable.

Secondly, considering how self-efficacy, in general, has been integrated with other theoretical models that discuss developments of perceptions, attitudes, and behaviors, a second direction for future research is to explore such possibilities involving this research's measurement model. Now that academics have another way to measure self-efficacy in the context of innovation and innovative tendencies, it will be theoretically easier to include this variable in other models and their applications, such as the theory of reasoned action (TRA) or theory of planned behavior (TPB) applied to learning situations.

Lastly, because this ongoing discourse is carried out in the context of education and training, and as seen in this research, a number of variables external to the question of how to approach innovation and entrepreneurial self-efficacy development, such as individual demographics and institutional considerations, must be further studied. The effect of these variables on the practical applications of this research is something that is important as well. Understanding these additional effects would help craft better approaches in the future.

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