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The impact of entrepreneurial leadership on team climate and innovation work behaviour in start-up contexts

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THE IMPACT OF ENTREPRENEURIAL LEADERSHIP ON TEAM CLIMATE AND INNOVATION WORK BEHAVIOUR IN START-UP CONTEXTS

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The Impact of Entrepreneurial Leadership on Team Climate and Innovation Work Behaviour in Start-Up Contexts

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I hereby declare that this DBA dissertation is my original work and it has been written by me in its entirety. I have duly acknowledged all the sources of information which have been used in this dissertation.

This DBA dissertation has also not been submitted for any degree in any university previously.

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30 May 2019

Abstract

The Impact of Entrepreneurial Leadership on Team Climate and Innovation Work Behaviour in Start-Up Contexts

Achieving start-up success is a multi-dimensional challenge. Against this background, this research centres around the experiences gained at an Asian University with a postgraduate Master of Science in Innovation program (MI) aimed at creating novel and viable business ventures as part of so-called Capstone Projects. Given concerns about the - at times - somewhat mediocre nature of ideation and business model creation outcomes of some of the students' capstone projects in contrast to a couple of very successful, award-winning innovation projects, emphasis was put on identifying and understanding the type of leadership that drives high-quality new ventures, namely *entrepreneurial leadership*. Other critical factors for start-up success were identified and analysed through mixed method research: *entrepreneurial self-efficacy*, *team climate* and the *appreciation of age diversity*. Based on semi-structured interviews with MI graduates, a conceptual model was developed to examine the interrelatedness of entrepreneurial leadership impact and the critical factors mentioned above. This was followed by a survey questionnaire to gather data on MI graduates aimed at empirically testing the conceptual model and its hypotheses.

In the empirical test, entrepreneurial leadership was significantly associated with team climate. The study results suggest that team climate mediates the effect of entrepreneurial leadership impact on innovation work behaviour. This finding helps to understand how effective leaders operate and succeed in a start-up environment. Start-up innovation teams are small and constrained by limited

resources. The team climate plays an important role in these innovation teams. In a diverse innovation team, team members often get into heated arguments during business discussions resulting in negative team climate. Strong entrepreneurial leaders are able to foster a positive team climate that promotes innovation.

This research also revealed that age diversity can have a negative impact on team climate, e.g. when members do not appreciate other members who are younger or older. In the context of the surveyed innovation teams, appreciation of age diversity among members was positively associated with a positive team climate. However, the study results also suggest that appreciation of age diversity alone is insufficient to foster innovation work behaviour in a team. Team members require a strong entrepreneurial leader to lead them to innovate, e.g. by transforming innovative ideas into useful applications. Such leaders often have strong entrepreneurial self-efficacy and can empower team members to make innovation work, i.e. entrepreneurial leaders of innovation teams succeed in encouraging team members to seek entrepreneurial goals, stimulating an innovation orientation amongst them, identifying innovation opportunities and so forth. To sum up, this study offers new insights into the type of *entrepreneurial* leadership required to successfully lead innovation teams in a start-up context in order to exploit related business opportunities.

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Dedication

This thesis is dedicated to:

My beloved parents, who have supported me emotionally and financially all these years in my academic pursuit,

My dearest wife, the strong pillar in our household,

My beloved children, for the joy and happiness in our home,

My sisters for their encouragement and support.

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Lastly, I would like to thank my family, my parents, my wife, my children, my sisters and my friends for their support and encouragement throughout my dissertation.

Chapter 1 - Introduction

1.1 Introduction

Achieving start-up success is a multi-dimensional challenge. The broad purpose of this research study was to identify what drives innovation success of start-up teams. This research reports experiences at an Asian University's Master of Science in Innovation program (MI) aimed at creating novel and viable business ventures as part of capstone projects. There were concerns about the somewhat mediocre nature of ideation and business model creation outcomes of the students' capstone projects vis-à-vis a couple of very successful award-winning innovation projects. These MI project team's mimic start-up teams in the market. A mixed-method study of exploratory interviews and a survey was conducted to examine this phenomenon.

1.2 Background of the research

Singapore, a 50-year-old island state country, has been able to survive and prosper due to its strategic location in the heart of South East Asia and because it is a major maritime port connecting trade from Asia to Europe trade. Singapore's success has been largely credited to a stable political environment and a business-friendly government. Singapore has attracted an enormous number of FDIs and foreign companies to set up regional headquarters and manufacturing facilities. As of 2017, the Singapore Stock Exchange (SGX) had a total of 754 firms with 40% overseas listing value at USD $700 billion.

Despite the economic success of Singapore, home-grown successful entrepreneurs have been rare in Singapore. Many Singaporeans prefer to work for multinational companies, then start their own businesses. Singapore's GDP growth

has slowed down to 2-4 % during the past 10 years after growing at double digits from the 1960s to 2000. As the economy matures, Singapore's government is looking at ways to grow the economy. Over-reliance on foreign companies for growth can potentially cause issues, as neighbouring countries develop and improve their infrastructures. There is also the danger that foreign companies may move out of Singapore as the cost of doing business is so much higher here as compared to neighbouring countries (Webb, 2017).

Since 2000, Singapore's government (realising the importance of entrepreneurship in creating jobs and growing the economy) has invested heavily in creating a strong start-up environment, with heavy investments into R&D, tax exemption credits for start-ups, a strong patent law, and the provision of government-led funding (National Research Foundation (NRF), 2015). This has resulted in an increase in entrepreneurial activities, and in 2015 more companies were created annually as compared to 2005 (Narasimhalu, 2015). Universities in Singapore have started to establish innovation centres as incubators, and collectively this has helped to incubate 257 companies since 2001 (Neo, 2017). Local Universities have also created several novel innovation and entrepreneurship-related degree programs.

What does it take to create successful entrepreneurship? For a long time, scholars have been debating the question whether entrepreneurs are born or whether can they be taught (Colette, Frances, & Claire, 2005). There is evidence that entrepreneurship education does in fact stimulate participants to create new ventures, but it can also be argued that participants who signed up for such programs already had the intention of starting their own businesses (Matlay, 2008). In entrepreneurial education contexts, students are usually put into a group project environment to ideate business ideas and to create a successful venture. Successful

start-ups are often created in a team environment with strong leadership. Successful firms in the technology sectors are known for their innovative leaders. Examples include Bill Gates, Steve Jobs and Mark Zuckerberg. They all have something in common: they dropped out of college. While one could argue that they were not in the correct degree program that trains entrepreneurs, we cannot deny the importance of entrepreneurial leadership as an enabler of successful entrepreneurship as an outcome (Beh & Shafique, 2016).

The other important element in start-up success is innovation (Drucker, 1998). Innovation is part of a start-up process in ideation and creation, where typically a team of individuals comes together with diverse backgrounds and skillsets to create a new business. In order for a new business to survive and outperform the incumbents, it has to provide something different in the market. In the current fast-growing economy, innovation is not only a necessary element found in start-ups, it is also an important element for incumbent businesses to survive when they face challenges from new start-ups. Salesforce.com, Amazon, Netflix, Facebook and Tesla are some of the most innovative companies in the world, and their success from start-up to Fortune 500 company status can be attributed to innovation ("The World's Most Innovative Companies", 2018). The leaders of these companies are also known for their entrepreneurial leadership strength that drives their companies towards commercializing innovative ideas into successful products and services.

This research study intends to shed light on some of the antecedents of successful and innovative capstone project outcomes based on the case of the Masters of Science in Innovation (MI) program at a Singaporean University that trains students to become “entrepreneurial leaders” capable of creating new businesses. The program has been running since 2012 with about 160 graduates. The master course

is a 12-month weekend-based course attended by mostly working adults. The broad objective of the course is to enable the students to appreciate what it takes to make innovation work within an organization and to come up with a viable start-up business (plan). The capstone innovation project cycle mimics a start-up process. The students must pitch their project ideas to both professors and potential investors several times after they have gathered external advice from mentors and resident entrepreneurs - similar to what start-up founders do when they pitch for funding. Project groups can submit their capstone project ideas at international entrepreneurial competitions. Over the years, a few groups enrolled in the program have won awards in international start-up competitions. Others have not been so successful. What makes the difference between success and failure?

1.3 Purpose of the study

The purpose of this research study was to identify what type of leadership drives start-up teams in performing innovative work based on a study of MI project teams. MI project teams mimic the journey of a start-up company from team formation to securing funding, including pitching to venture capitalists. Innovation is the key success factor for a start-up to compete and secure funding. Examining successful MI project teams will provide important insights into why some of the teams are able to produce innovative products and services. This study uses a mixed method approach of explorative interviews (Stebbins, 2001) with MI students to understand the key antecedents that drive innovation in MI teams. A conceptual model and hypotheses were developed based on the exploratory study. This was followed by conducting a survey (Fowler, 2013) of MI students to empirically test the model.

1.4 Importance of the study

Having successful innovative start-ups is vital for any country to remain competitive. The result of this study will benefit the policy makers and leaders of innovation centres in their understanding on what drives innovation in start-up team contexts and be able to create more successful start-ups in the country.

Academics will be able to benefit from the study findings by designing better innovation and entrepreneurial courses that produce successful innovation outcomes. Modules on entrepreneurial leadership can be introduced in their programs to equip students with better entrepreneurial leadership skills.

Based on the results of the research findings, managers of start-ups will be able to gain insights in creating successful innovation teams and understand what drives innovation in such teams. For companies to be successful and survive, they must constantly engage in some form of entrepreneurial or innovation activities in new product creation, product enhancement and product diversification. This research will be useful for companies and their bosses to understand the type of leadership that is required to lead successful innovation teams.

1.5 Theoretical Framework

Leadership has been a popular topic of study by scholars in the last few decades (Day, Fleenor, Atwater, Sturm, & McKee, 2014). Scholars have examined leadership approaches in military leaders and successful business leaders. Different leadership theories have emerged over the years, but the focus has been on business leaders leading multinational companies. Start-up companies are different from

multinationals. They are small and medium-sized enterprises that are lean and lack resources. A different type of leadership is required to run start-ups. Start-up leader are also entrepreneurs. Entrepreneurs perform a specific task in recognising opportunities, creating products and commercializing them into successful businesses. The study of successful start-up leaders is an intersection between leadership theory and entrepreneurship theory (Cogliser & Brigham, 2004; Gupta, MacMillan, & Surie, 2004; Renko, El Tarabishy, Carsrud, & Brännback, 2015). Entrepreneurial leadership is a nascent theory developed based on small and medium enterprises, and the role of the entrepreneur best describes the role of a successful leader in an innovation team (Cogliser & Brigham, 2004; Gupta et al., 2004; Renko et al., 2015).

As Renko et al. (2015) have convincingly argued, entrepreneurial leadership entails influencing and directing the performance of group members towards the achievement of organisational goals that involve recognising and exploiting entrepreneurial opportunities. A good entrepreneurial leader is able to recognise opportunities in the ideation process and to commercialize this idea into a successful business outcome in exploiting entrepreneurial opportunities. It is a style of leadership practiced by innovative leaders. In this research, entrepreneurial leadership will be examined with regard to its impact on innovation teams. Renko et al. (2015) ENTRELEAD measurement scale was used to measure entrepreneurial leadership of the MI team leader (Renko et al., 2015). The ENTRELEAD scale was developed and validated following the standard of scale studies (Hinkin, 1995). A detailed discussion on entrepreneurial leadership can be found in the literature review in Chapter 2.

1.6 - Research Questions

1.6.1 What does it take in terms of entrepreneurial leadership to create innovative new business ventures as outcome of students' capstone project? Start-up success is rare. 50% of start-ups do not survive after one year, and less than 80% survive more than 4 years. Those who survive and become successful are known for their innovation and entrepreneurial leadership quality. Non-home-grown successful entrepreneurs in Singapore, such as Forrest Li of Garena or Anthony Tan of Grab, helped to lead successful tech start-ups (unicorns). Other successful home-grown tech entrepreneurs include Tan Min-Liang of Razer and Quek Siu Rui of Carousell. These companies are all known for innovation and their entrepreneurial leaders.

For a start-up to survive and be successful, it must be innovative broadly speaking, and that arguably requires a unique type of leadership. This type of leadership is not always present in some start-up teams resulting in start-up failure. Based on feedback from the program director and external judges, some MI projects were described as 'mediocre' due to poor ideas that lack innovation. In contrast, teams that won awards were considered as having innovative ideas. Does 'good' entrepreneurial leadership matter in creating innovative projects?

1.6.2. What is the role of entrepreneurial leadership in creating a robust team climate in diverse (successful) innovation teams? Most entrepreneurial and innovation activities are created in a team environment. Team climate plays an important role in the success of the team. The leader in an innovative team not only needs to lead the team in creating a successful innovation outcome; he or she also needs to ensure that the team has a positive team climate.

Most innovation teams are diverse, socially and in terms of expertise which aids in generating different ideas from different perspective, but diversity may also cause conflicts as team members struggle to relate to diverse members. Team climate will become negative and disrupt the progress of teams. Leadership plays an important role in the team climate of the team. Without a good leader to lead the team, conflicts might escalate and result in a break up or members leaving the group, and that will affect the team performance. Does a good entrepreneurial leader have a 'positive' impact on team climate in a diverse innovation team?

1.7 Overview of the qualitative exploratory research design

Exploratory interviews were conducted with MI students from different capstone teams. The objective was to capture key antecedents that drive successful innovation outcomes. An exploratory study helps to uncover the complexity and multidimensional nature of the problem. Semi-structured interviews were conducted which helped to discover important insights regarding leadership impact on the innovation team. Based on the findings and a literature review, potential key antecedents were identified. The research questions and hypothesis were derived from the exploratory findings. A conceptual model was created as the outcome of the exploratory research. More details of the exploratory research are provided in Chapter 3.

1.8 Overview of quantitative survey research design

To empirically test the conceptual model, a survey was conducted of different MI teams. Survey questions were designed based on established measurement scales that measured the antecedents. As part of ongoing research on age diversity in

project groups, other survey questions were also included during the survey with regard to the appreciation of age diversity. Hierarchical regression and multi regression analysis were conducted to examine the association of the variables in the model. The Baron & Kenny approach (Hayes, 2009) was used to examine the mediation effects. The Sobel test (Sobel, 1982) and Preacher & Hayes' bootstrapping approach (Preacher & Hayes, 2004) were conducted to confirm the mediation. More details of the research design are provided in Chapter 4.

1.9 Definition of Terms

The following are terms used in this study.

Appreciation of age diversity: A measurement of an individual's appreciation of contribution of members from different age diverse groups (Wegge, Schmidt, Liebermann, & van Knippenberg, 2011).

Commercialization: The last stage of innovation. New products or services are introduced to the market (Tushman, 1977).

Entrepreneurial Leadership: An emerging leadership style practiced by innovation leaders. Entrepreneurial leadership entails influencing and directing the performance of group members towards the achievement of organisational goals that involve recognising and exploiting entrepreneurial opportunities (Renko et al., 2015).

Entrepreneurial Self-efficacy: Entrepreneurial self-efficacy is a measure of a person's belief in their ability to conduct successful entrepreneur activities (McGee, Peterson, Mueller, & Sequeira, 2009).

Entrepreneurship: The act of starting a new business venture using innovation to compete in the market (Drucker, 1998).

Ideation: The first stage of innovation activities. It involves brainstorming and idea creation (Tushman, 1977).

Innovation: Innovation can be defined as "*The process of translating an idea or invention into a good or service that creates value or for which customers will pay*" ("Innovation", n,d.). There are 5 stages of innovation: idea generation/ideation, screening, concept development, product development and, finally, commercialization (Tushman, 1977).

Innovation Outcome: Refers to the output of an innovation team, in terms of a final business plan proposal by the MI project team or a product developed by an innovation team. Measurement of the innovation outcome is discussed in Chapter 3.

Types of MI teams: (i) Average (mediocre) – MI teams that did not win awards and had poor business ideas for their capstone projects, (ii) award-winning teams – Teams that won external competitions and had good innovative ideas, (iii) drop-outs – MI team members that dropped out from the course.

Start-ups: Start-ups are newly formed companies, usually by a small team of individuals in the pursuit of developing a new product or service for the market.

Team Climate: Team climate is a measurement of the shared perceptions of team members (Crossan & Apaydin, 2010).

1.10 Assumptions, delimitation and limitations of the study

The support provided by the program was similar for all MI teams in the different cohorts. All MI teams were given the same amount of assistance in the capstone projects with the same entrepreneurial training provided by the various MI modules that were taught. This is based on the MI program course syllabus, which did not change between 2015 to 2017 ("Master of innovation Profile," 2015). Another assumption was that all participants of the interviews and surveys answered the questions honestly without bias regardless of how long ago they had graduated from the program. This was based on the restriction set on the selection of the sample comprising specific cohorts of MI graduates.

A delimitation of the study was that the participants of the studies are part-time Master of Innovation students attending an innovation course while engaging in innovation activities in a group context of a capstone project. The participants may not fully represent full-time start-up teams, where the teams are working on tight budgets and lack innovation training. Findings may not be applicable for all start-up teams but the focus on leadership impact on teams will be relevant.

As part of an on-going research project on age diversity of innovation teams, there was bias in the interview related to asking age-diversity related questions. At the

end of the exploratory study, the research uncovered that appreciation of age diversity was not significant for all capstone teams as most of the teams were not age diverse. But in the survey, all MI teams were asked to relate to the appreciation of age diversity issue, and the responses suggest that it was deemed to be important for MI students in creating a positive team climate.

1.11 Summary and outline of the following chapters

This study sought to understand the antecedents of successful innovation work behaviour and outcomes of MI teams, through examining MI capstone project teams through mixed-method research. The results of this study may be useful for academics running innovation or entrepreneurial courses, and companies' HR professionals in training innovation teams. This research hopes to fill the gap in empirical research on entrepreneurial leadership. Lastly, these results may be helpful to entrepreneurs and start-ups involved in innovation outcome creation.

Chapter 2 is a literature review of the research; antecedents associated with creating innovation work behaviour and outcome are examined. Chapter 2 also describes the primary gap in the literature of entrepreneurial leadership, and positive team climate was identified and how this research fills the gap in the literature. In Chapter 3 the qualitative exploratory study and the conceptual model are introduced. In Chapter 4, the quantitative research design and survey are discussed. In Chapter 5, the results of the quantitative researches are reported. Chapter 6 provides the interpretation of the research results. Chapter 7 discusses the conclusion of the research findings and the theoretical and managerial implications of the research. This is followed by Chapter 8 that contains the recommendations and possible future areas of research from this study.

Chapter 2 - Literature Review

2.1 Introduction

This chapter provides a review on previous research on leadership, entrepreneurial self-efficacy and team climate that are related to the phenomenon of innovation team success in creating innovation outcomes, in the context of an MI capstone project team. Possible causes of creating innovation outcomes could be multifaceted predictors. In this literature review, the focus was on the leadership of the MI teams, in particular entrepreneurial leadership and emerging theory in the study on innovation teams. Being a nascent theory, there is limited empirical research of entrepreneurial leadership. This study also reviewed related variables of an entrepreneurial leader in his ability to perform entrepreneurial activities and the ability of the team members in entrepreneurial self-efficacy. In order to measure the positive climate that promotes innovation work behavior of the MI team, the team climate TCI inventory (Anderson & West, 1996) variable was reviewed. Team climate is the shared perception of the team members of the team environment. Appreciation of age diversity (Wegge et al., 2011) was also included in the literature review due to an ongoing research project on age diversity. Appreciation of age diversity is a measure of team members' level of appreciation of age diversity in a team. Positive appreciation of age diversity implies that members find age diversity acceptable and negative means not acceptable. The main purpose of the literature review was to summarize previous work on entrepreneurial leadership impact on teams. The study sought to develop a conceptual framework for predicting innovation work behavior of innovation teams.

The literature review began with a keyword search on the University research library website with links to newspaper, e-books, and journals. The library search portal has subscriptions to established scientific publishing databases, SAGE, Taylor & Francis Social Journals, EBSCOhost, ProQuest, DOAJ and Elsevier. Each of these databases was searched separately for highly referenced publications. The focus was on top journals, top cited articles, recent publications and publications that advanced the theory. Annual journal review of topics on entrepreneurial leadership direction was found to be most helpful (Claire M Leitch & Volery, 2017). A total of 170 relevant journal articles, books, and newspapers were reviewed. Endnote software was used to store the references.

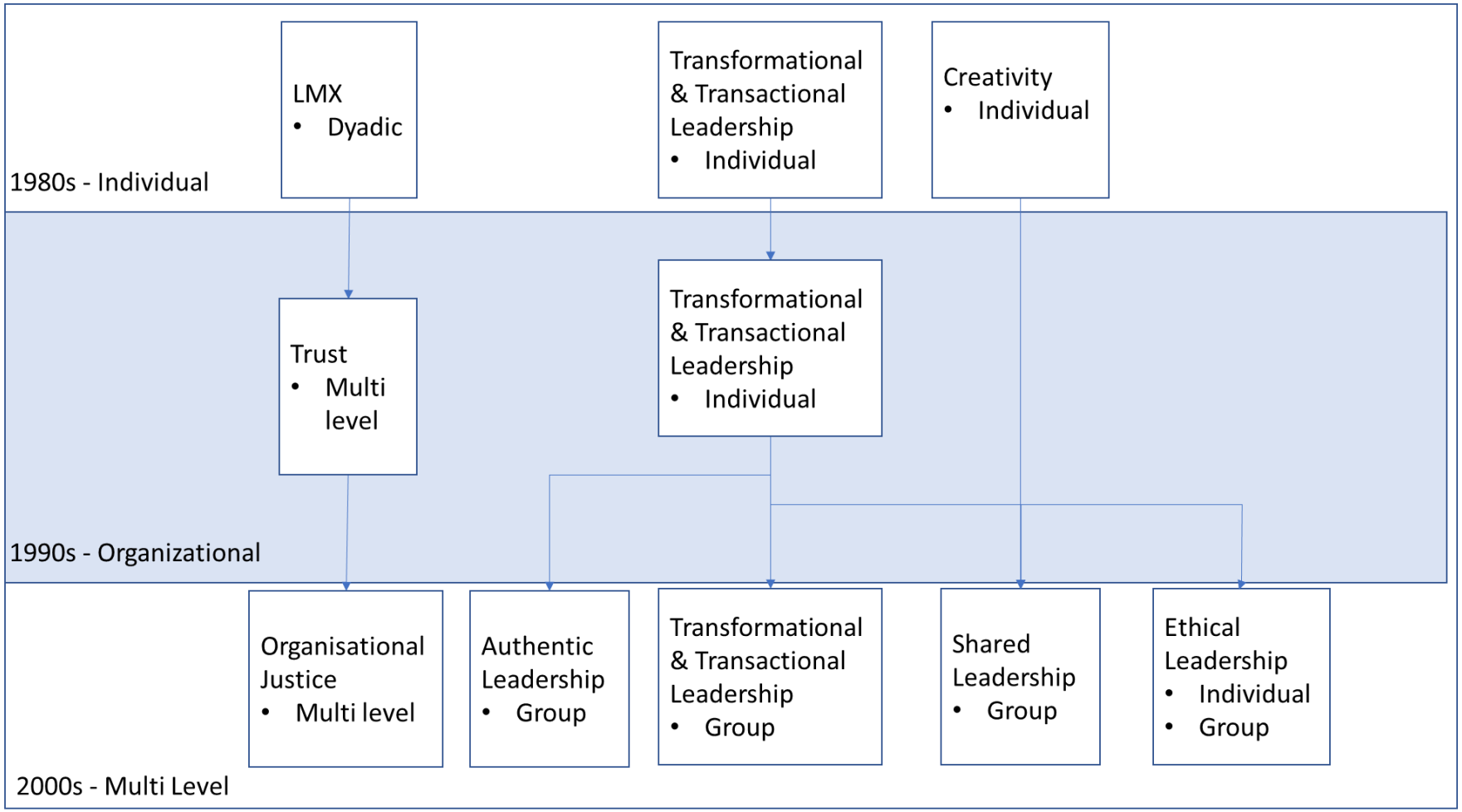
2.2 Discussion on underpinning theory - Entrepreneurial Leadership

2.2.1 Leadership theory

Scholars' leadership studies have evolved rapidly in the last few decades. Different streams of leadership styles have been introduced, creating a wealth of leadership theories. The evolution of leadership research began from the study of individuals through understanding personality traits and dimensions of successful leaders in different contexts of business and military leaders. Next, the study evolved into different styles of leadership and leaders and followers' theories.

The conceptualization of leadership has also evolved from personal to organisational level studies. Since the 2000s, scholars have been publishing findings from different streams of leadership style research with focus on organisational and individual levels to examine its impact on innovation and creativity as shown in Figure 1 (Batistič, Černe, & Vogel, 2017).

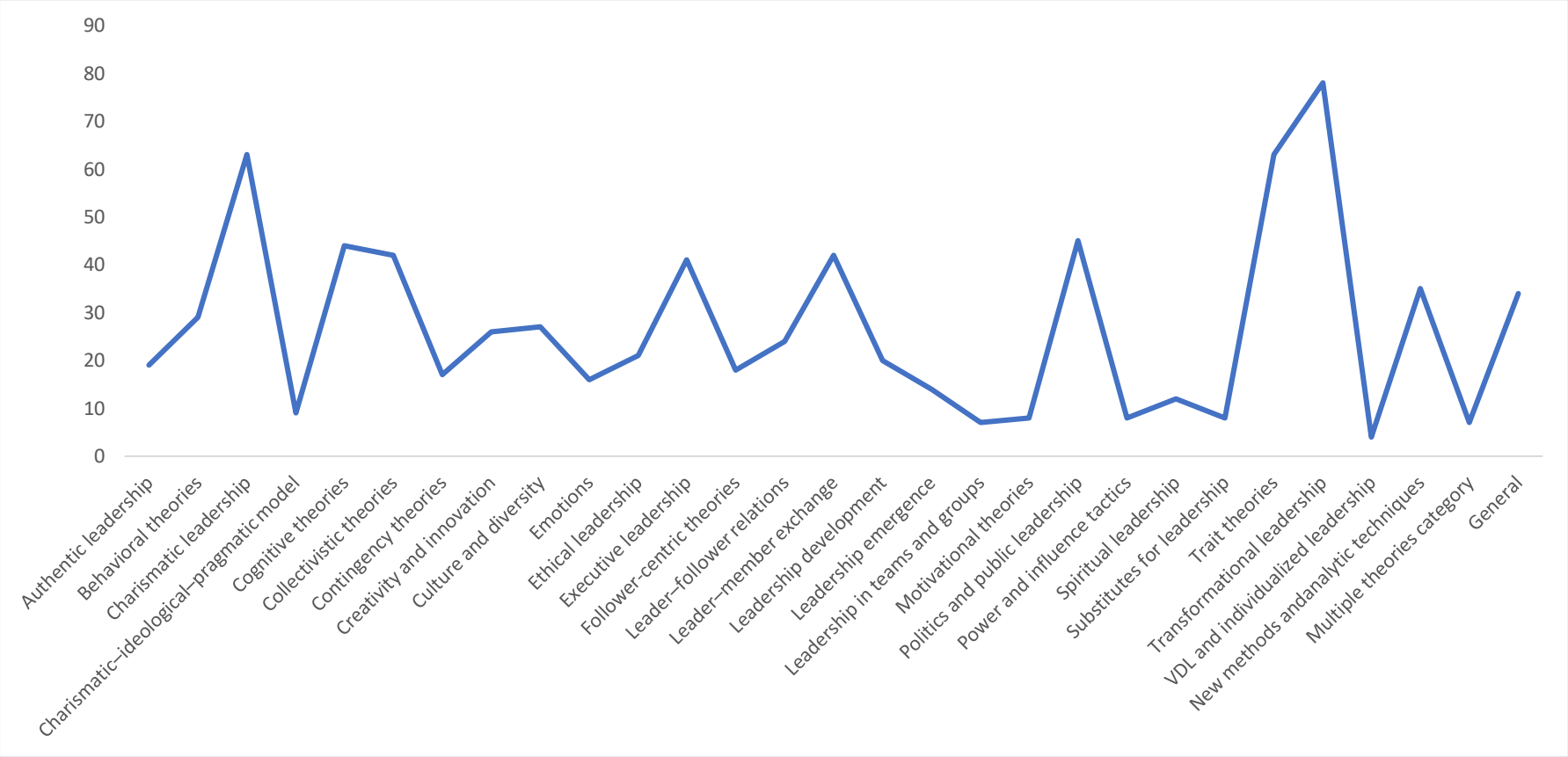
Figure 1. Leadership theory conceptualization evolution (Batistič et al., 2017)



The focus of this study was on a leader leading an innovation team. This is a multi-level research approach on leaders and innovation teams, similar to start-up teams in a start-up environment. Organizational or firm level studies have been conducted mainly on multinational or listed companies. This is due to the easier access of data from these companies, and the theory development was also based on running large corporation. However, start-ups are different. They function like a small and medium enterprise team. Entrepreneurship studies by scholars are traditionally part of the small and medium enterprise research (Cunningham & Lischeron, 1991).

One of the most popular leadership theories in the last decade has been transformational leadership. In a 25 years review of Leadership Quarterly in 2013 more than 85 publications were on transformational leadership alone and hundreds more on related leadership topics (Dionne et al., 2014). Transformational leadership is the most popular leadership style that has been used in conceptual and empirical studies (Dionne et al., 2014) as shown in Figure 2. It is also the most popular leadership theory associated with creativity and innovation. Transformational leaders in a multinational company or the top management in a company lead with charisma, inspiration, intellectual stimulation and individual consideration (Bass, 1990). In other organisational contexts, team leaders who manage a small team may function as transactional leaders that focus on completing a single task and the vision of their leader. Start-up leaders are different as they focus on completing a single task in commercialization of a product for the company and also provide the vision of the company. Start-up leaders operate in a low resource environment. Start-up leaders are not able to act in individual consideration, they might have to cut loose non-performers from the team if the team is not performing in order to survive.

Figure 2. Analysis of major leadership theory in conceptual and empirical research publications (Dionne et al., 2014) (x axis=leadership theories, y axis = number of publication in the last 25 years since 2014)



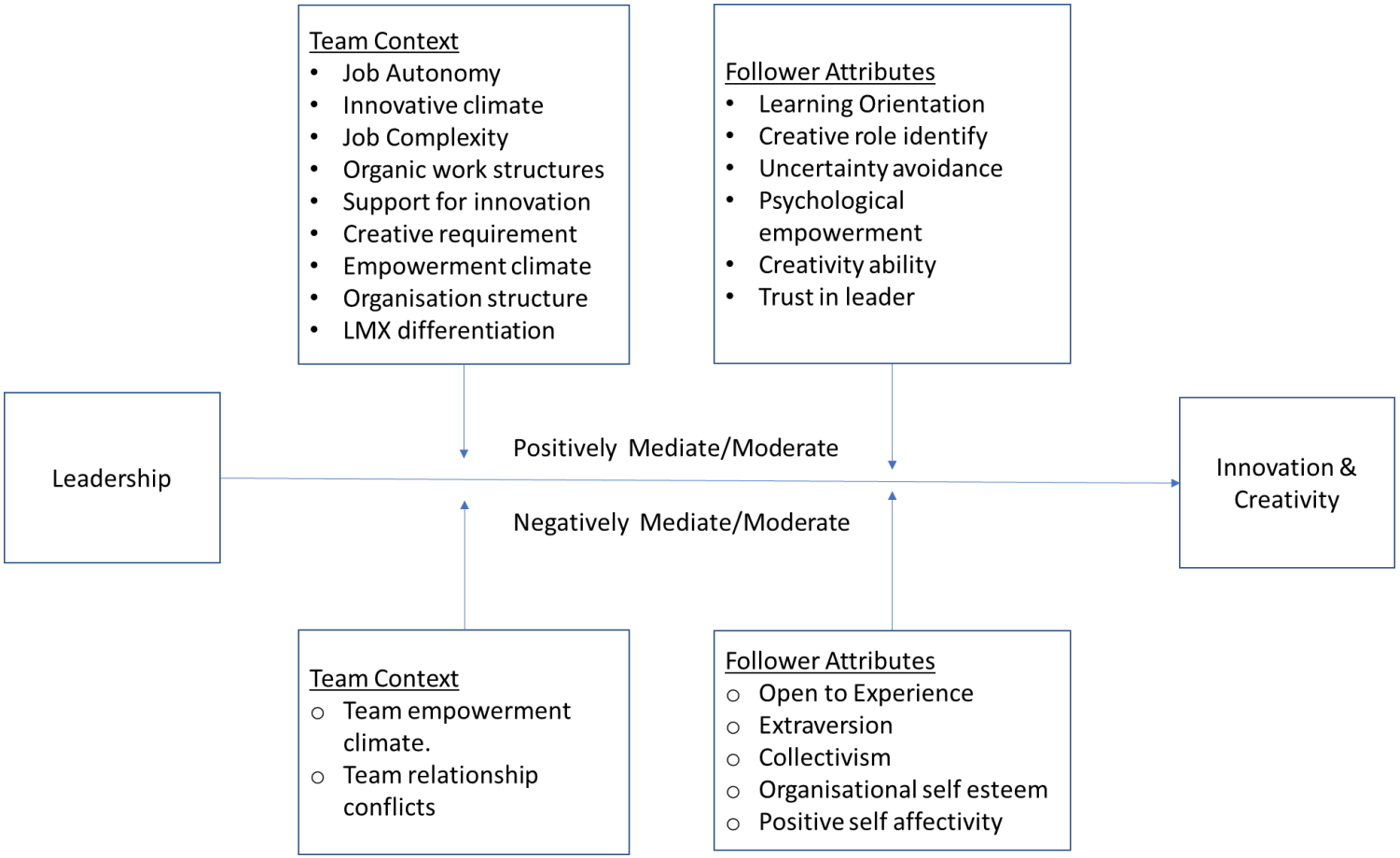
The other focus was on the search of leadership style that helps to create innovation through leadership and the role of an entrepreneur. All start-up innovation teams performed similar tasks in ideation, creation and commercialization. The search for the most suitable leadership theory was narrowed to a leadership style that impacts innovation, small and medium enterprises or small team success. Entrepreneurial leadership theory was identified as one of the most suitable leadership styles that represents the research problem. It is a leadership theory developed based on the entrepreneur environment of small and medium enterprise (Claire M Leitch & Volery, 2017).

Entrepreneurial leadership being a nascent theory has no related publication in Leadership Quarterly (Dionne et al., 2014). Most of the research on entrepreneurial leadership was published in other journals: Journal of small and medium enterprise, Journals of small business management, International small business journal and Journal of business research (Darling, Keeffe, & Ross, 2007; Leitch & Volery, 2017; Newman, Herman, Schwarz, & Nielsen, 2018; Renko et al., 2015).

Popular mediators and moderators of leadership impact on innovation was also reviewed in the literature search. Figure 3 shows a recent review of research papers published in the Leadership Quarterly by Hughes et al. on the mediators and moderators of leadership style that impacts innovation and creativity (Hughes, Lee, Tian, Newman, & Legood, 2018). There is a gap in examining the mediators and moderators of entrepreneurial leadership theory. A review of the exploratory results suggests some interesting variables that might affect innovation work behaviour/outcomes. According to MI graduates, one challenge is having a positive team climate when strong egos crash during the ideation stage of the capstone

project. In this study, positive team climate as potential mediator and moderator of entrepreneurial leadership impact on innovation will be examined. An entrepreneurial leader role is different from other types of leadership. An entrepreneurial leader not only needs to lead but he or she will also need to execute as well. It's about the role of a doer in the team who leads by execution. In order for an entrepreneurial leader to lead, he or she will need to be competent in entrepreneurial activities.

Figure 3. Moderators / mediators of leadership theory (Hughes et al., 2018)



2.2.2 Entrepreneurial leadership

Entrepreneurial leadership is an emerging theory that is still evolving and there are not a lot of tools in this area to assess its characteristics and behaviours. Nevertheless, progress has been made since 1991 until the present as shown in Table 1 below (Leitch & Volery, 2017) .

Scholars have suggested that entrepreneurial leadership can be considered as a new paradigm that cuts across leadership and entrepreneurship (Leitch & Volery, 2017). The two different paradigms of Leadership and Entrepreneurship: Leadership research is about the study of leaders in "influencing others to understand and agree about what needs to be done and facilitating individual and collective efforts to accomplish shared objectives" (Leitch & Volery, 2017). Entrepreneurship research focuses on the success of the entrepreneur in creating new businesses. Both start off focusing on successful leaders and successful entrepreneurs as individuals, and the individual traits that create successful leaders and entrepreneurs (Bagheri & Pihie, 2011). Successful leaders and entrepreneurs share similarities in risk-taking and creativity, but an entrepreneur role is more complicated than that of a leader. An entrepreneur not only needs to lead but he/she must also be able to execute. Entrepreneurs also have different challenges as they typically start off as small and medium enterprises with minimum resources and maybe working in an unknown field/domain.

Table 1. Entrepreneurial leadership research (Leitch & Volery, 2017)

(Cunningham & Lischeron, 1991)	"Entrepreneurial leadership involves setting clear goals, creating opportunities, empowering people, preserving organisational intimacy, and developing a human resource system."
(Nicholson, 1998)	"Entrepreneurial leaders can differ from other leaders and non-leaders in specific respects including traits such as high risk-taking behaviour, openness, need for achievement and low deliberation. Entrepreneurial leadership is also about being resistant to the socialisation that shapes managerial personality and the willingness to escape from management into leadership."
(Ireland, Hitt, & Sirmon, 2003)	"Entrepreneurial leadership entails the ability to influence others to manage resources strategically in order to emphasize both opportunity-seeking and advantage-seeking behaviours."
(Cogliser & Brigham, 2004)	"Entrepreneurial leadership should involve idea generation, idea structuring and idea promotion, where idea generation is critical in the early stages of a venture and idea structuring and promotion in the latter stages. Therefore, an entrepreneurial leader does not only need to recognise opportunities, but he or she must also be able to marshal the resources necessary to reach the potential of that opportunity."

(Gupta et al., 2004)	"Leadership that creates visionary scenarios that are used to assemble and mobilize a supporting cast of participants who become committed by the vision to the discovery and exploitation of strategic value creation."
(Kuratko, 2007)	"Entrepreneurial leadership is a unique concept combining the identification of opportunities, risk-taking beyond security and being resolute enough to follow through."
(Surie & Ashley, 2008)	"Leadership capable of sustaining innovation and adaptation in high-velocity and uncertain environments."
(Leitch, McMullan, & Harrison, 2013)	"Entrepreneurial leadership is the leadership role performed in entrepreneurial ventures, rather than in the more general sense of an entrepreneurial style of leadership."
(Renko et al., 2015)	"Entrepreneurial leadership entails influencing and directing the performance of group members towards the achievement of organisational goals that involve recognising and exploiting entrepreneurial opportunities."

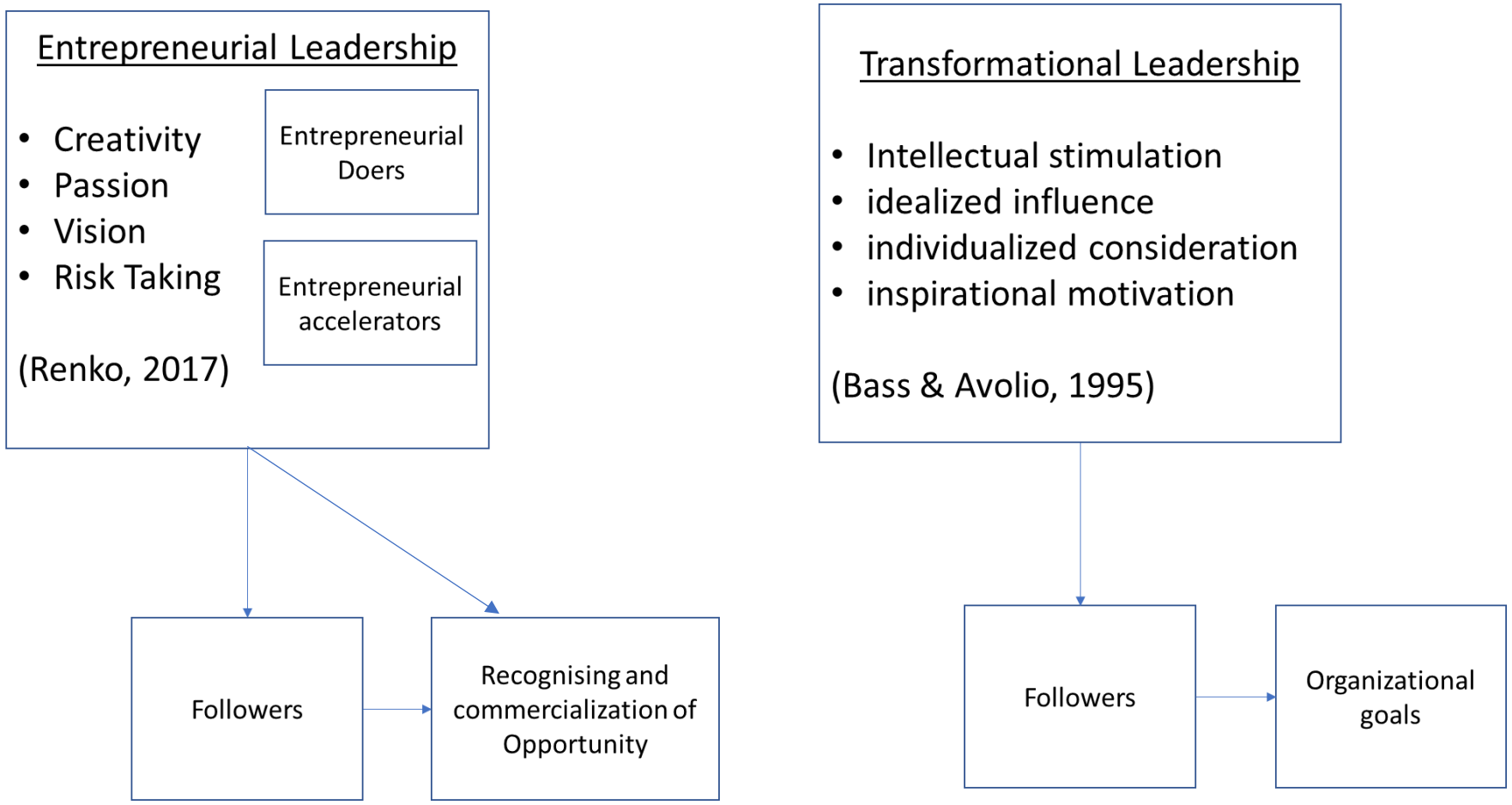
Leadership research has progressed to research focusing on the style of leadership and leadership follower's theory as scholars argued that leadership can be learned and improved. A string of leadership style theories has emerged (Avolio, Walumbwa, & Weber, 2009). The leadership style that has been closely related to entrepreneurship is the transformational leadership style (Renko et al., 2015). In transformational leadership, the four constructs are intellectual stimulation, idealized influence, individualized consideration and inspirational motivation as shown in Figure 4 (Bass & Avolio, 1995). Not all of these constructs apply to a good entrepreneur leader. Intellectual stimulation is linked to encouraging creativity and inspirational motivation linked to charismatic leaders. Entrepreneurial leaders may not be described as charismatic or inspirational by others as often as transformational leaders because entrepreneurial leadership research had been focused on entrepreneurs starting small and medium enterprises. These entrepreneurs were mainly focused on launching their business and survival (Podsakoff, MacKenzie, Moorman, & Fetter, 1990). As entrepreneurs have limited resources, the focus of entrepreneurial leaders is on enhancing followers in terms of their entrepreneurial passion and self-efficacy (Cardon, Wincent, Singh, & Drnovsek, 2009). Some transformational leaders may score high on individual consideration. Many top entrepreneurial leaders are not known to have good people skills, for example Steve Jobs (Isaacson, 2012). What they are good at is enhancing followers' beliefs in their entrepreneurial skills and ignite passion for innovation and creativity. The characterises of entrepreneurial leadership are vision, risk-taking, passion and creativity as shown in Figure 4 (Antonakis & Day, 2017). Strong entrepreneurial leaders are creative and challenge followers to take risks in creating innovative products. They are able to recognise opportunities and have the

vision and passion to lead the followers in successful commercialization of the product. Entrepreneurial leaders are also role models for followers in entrepreneurial opportunity recognition and commercialization which Renko called "*Entrepreneurial Doers"*. Leaders also act as "*Entrepreneurial accelerators"* in empowering and motivating followers to focus on opportunity recognition and commercialization activities (Antonakis & Day, 2017).

In this research, the ENTRELEAD measurement scale by Renko et al. (2015) was used to measure entrepreneurial leadership of the MI team leader (Renko et al., 2015). Newman et al. (2018) recent empirical test using the ENTRELEAD scale confirmed our understanding of entrepreneurial leadership as they found entrepreneurial leadership to have a moderating effect on creative self-efficacy being the creativity level of employees. Employees with leaders who practice entrepreneurial leadership have a higher creativity. Their results show employees react better with entrepreneurial leadership in an innovative task environment (Newman et al., 2018).

There is still limited research conducted on entrepreneurial leadership impact on innovation work behaviour/outcomes with suspected mediators and moderators of leadership as shown in Figure 3. This research study hopes to fill the gap in our understanding of entrepreneurial leadership.

Figure 4. Entrepreneurial leadership and transformational leadership



2.3 Discussion of other variables that impact innovation work behaviour/outcome

2.3.1 Team Climate

Team climate is a multidimensional construct that measures the shared perceptions of the team members on their team. Team climate has been used to measure the effectiveness of group outcomes (Crossan & Apaydin, 2010). Positive team climate results in better performance for the team but the domain of the climate in team climate plays an important role. Different domains have different requirements (Anderson & West, 1998). Scholars in the field of innovation research have been interested in the impact of team climate in successful innovation. Anderson and West 1998 created the Team Climate Inventory TCI scale in measuring the team climate in an innovation environment. The instrument scale measured five factors of an innovation team, i.e. team vison, participative safety, task orientation, interaction frequency and support for innovation. TCI scales have been used in empirical research on transformational leadership and the impact of innovation (Bower, Campbell, Bojke, & Sibbald, 2003; Eisenbeiss, van Knippenberg, & Boerner, 2008; Kivimäki et al., 2007; Pirola-Merlo, Härtel, Mann, & Hirst, 2002). Pirola-Merlo et al. (2002) conducted empirical research on team climate and found that team climate mediates the relationship between transformational leadership and team performance (Pirola-Merlo et al., 2002). Kivimäki et al. (2007) empirically showed that negative team climate is related to high employee turnover (Kivimäki et al., 2007). Eisenbeiss et al. (2008) also empirically tested transformational leadership, and found that support for innovation TCI has a mediating effect on team innovation (Eisenbeiss et al., 2008). As transformational

leadership shares similarities with entrepreneurial leadership, a strong entrepreneurial leader should have a positive impact on team climate.

As entrepreneurial leadership is a nascent theory, there is limited empirical research on its impact on team climate. This research hopes to shed more light on the impact of entrepreneurial leadership on team climate.

2.3.2 Appreciation of Age diversity

There are different types of diversity in terms of social and expert diversity. Social diversity refers to diversity in terms of age, race or social class. Expert diversity refers to diversity in skillsets and experience. World-class successful innovation teams tend to be formed by social and expert-diverse groups. Expert diversity is positively related to learning and innovation as diverse members contribute in different ideas in group discussion, but social diversity tends to have a negative impact as it might cause conflict amongst group members when younger members cannot relate to the older members in terms of generation gap (Horwitz & Horwitz, 2007). Scholars have been researching on the impact of the age diversity (Beaver & Hutchings, 2005) among team members in terms of team conflict (Bassett-Jones, 2005; Harrison & Klein, 2007; Hentschel, Shemla, Wegge, & Kearney, 2013). Kearney & Gebert empirically tested age diversity in R&D teams and found that it affects team performance but this can be moderated by strong transformational leadership (Kearney & Gebert, 2009). In his exploratory case research, Menkhoff found that appreciation of age diversity in diverse teams has a positive impact in innovation teams as this creates a positive team climate and positive group affective tone that reduces conflict and promotes innovation (Menkhoff, 2015). Less

appreciation of age diversity was found to cause conflict among members of different age groups (Wegge et al., 2011). Wegge et al. developed a scale to measure the appreciation of age diversity in groups with questions on "If problems with our team arise, this is due to age differences in our team", "A team is more effective if its members belong to different age groups" (Wegge et al., 2011). In this study we used the instrument scale to examine the appreciation of age diversity among MI team members to understand its impact on team climate.

2.3.3 Team Identification

Scholars have been interested in team identification in sports team research (Branscombe & Wann, 1991; Matsuoka, Chelladurai, & Harada, 2003). Research has been conducted on the significance of individuals who identified themselves with a sport team. This can be linked to social identity theory *"where an individual derives a greater sense of self from the perceived awareness, value, and emotional significance of belonging to a group"* (Van Der Vegt & Bunderson, 2005). Researchers have shown that strong team identification is related to positive outcomes in conflict management (Desivilya, Somech, & Lidgoster, 2010), as a moderator in team performance (Bezrukova, Jehn, Zanutto, & Thatcher, 2009), in moderating the effect of social diversity in team learning behaviour (Van Der Vegt & Bunderson, 2005) and in managing diversity in teams (Eckel & Grossman, 2005). Team identification moderates the negative effect of diversity in teams (Eckel & Grossman, 2005). Researchers have shown that leadership style plays an important role in team identification. Transformational leadership (Kearney & Gebert, 2009) and servant leadership (Yoshida, Sendjaya, Hirst, & Cooper, 2014) styles moderate

the effect of team identification in diverse team as team members are able to rally behind a charismatic leader (Hoch, Pearce, & Welzel, 2010).

2.3.4 Innovation work behaviour

Innovation work behaviour can be defined as that of an individual who practices innovation in terms of creation and application of new ideas in the work place (West & Farr, 1989). Innovation work behaviour involves using creativity in ideation and idea realization processes. It has been used as an outcome variable in research to measure the level of innovation in different domains (Tang, 2006), including health care employees (Åmo, 2006) manufacturing firm employees (Wong & He, 2005) and R&D departments (Becker & Dietz, 2004). Scholars have examined the different leadership theories as a predictor of innovation work behaviour (De Jong & Den Hartog, 2007). Transformational leadership is most commonly associated with innovation work behaviour, with psychological empowerment as the moderator (Afsar, F. Badir, & Bin Saeed, 2014; Khan, Aslam, & Riaz, 2012; Pieterse, Van Knippenberg, Schippers, & Stam, 2010). As discussed earlier, transformational leadership shares similar characteristics in innovation with entrepreneurial leadership but does not represent leadership in small innovation teams as compared to entrepreneurial leadership. Entrepreneurial leadership is a nascent theory and there is limited empirical research available on its impact on innovation work behaviour. In this research, the innovation work behaviour scale (Janssen, 2000) was used to examine the innovation team behaviour of project teams and its relationship with other variables.

2.3.5 Entrepreneurial self-efficacy

Entrepreneurial self-efficacy is a measure of a person's belief in their ability of conducting successful entrepreneur activities (McGee et al., 2009). Similar to the self-efficacy construct, it measures the confidence of the individual. Scholars have been using this construct to measure individual intentions of starting a new business and being an entrepreneur (Wilson, Kickul, & Marlino, 2007). Entrepreneurial self-efficacy, gender and environmental factors are found to be predictors of entrepreneurial intention (Zhao, Seibert, & Hills, 2005). Hmieleski et al. (2008) found that firms where entrepreneurs had high entrepreneurial self-efficacy did not always perform well (Hmieleski & Baron, 2008). This is moderated with optimism and environment dynamism. Entrepreneurs with high self-efficacy who operate in a high environment dynamism with high optimism tend to take more risks. This might result in negative performance. Researchers have also found that entrepreneurial self-efficacy can be improved through entrepreneurial education (Piperopoulos & Dimov, 2015). In this research the entrepreneurial self-efficacy scale (McGee et al., 2009) was adapted to measure the students' perceived confidence level of entrepreneurial activities. The scale is built on the multi-dimensional steps of an entrepreneur's activities in searching, planning, marshalling, and implementing. A team makeup of members with strong entrepreneurial self-efficacy will be able to perform entrepreneur tasks more efficiently as each member is able to perform their task well. This in turn reduces conflict among members resulting in a positive team climate.

2.4 Summary

The findings of this literature review reveal that there is a gap in the knowledge of the leadership style that best creates innovation outcomes in start-up teams. As entrepreneurial leadership is a nascent theory, limited empirical research has been conducted. Most of the research published has been conceptual. During the review, Renko entrepreneurial leadership (Renko et al., 2015) theory was identified as the leadership style that best represents a successful leader in an innovation team environment. The concept of a leader as a leader and doer best describes the role of a leader working in a low-resource and challenging environment. The leader not only needs to lead but he or she has to perform entrepreneurial tasks and focus on commercializing of the innovation for survival. Renko has developed an instrument scale to measure entrepreneurial leadership (Renko et al., 2015). Being a new measurement scale, only a handful of empirical studies have been published. Literature of other variables was also reviewed with regard to their effects on innovation after the exploratory study in Chapter 4. Variables such as team climate and entrepreneurial self-efficacy were reviewed to understand their potential roles as mediating and moderating variables. As part of the age diversity study, appreciation of age diversity and team identification were reviewed, too. Team identification was dropped from the model as it was similar with team climate and research on team identification was focused on sports teams. The outcome variable innovation work behaviour was identified after the exploratory study phase. In the next chapter, the exploratory study and the conceptual framework will be discussed.

Chapter 3 – Exploratory Study and Conceptual Framework

3.1 Introduction

This chapter presents the MI capstone project teams, qualitative exploratory research study, hypothesis relationships among different variables and the proposed conceptual model. This research uses a mixed method approach of qualitative and quantitative research. The research started with exploratory qualitative interviews with members of the MI teams to capture key antecedents that may predict innovation work behaviour. Hypotheses were developed based on the exploratory study and the initial literature review of entrepreneurial leadership. The impact of some variables could be mediated by other variables. The proposed conceptual model is explained in three parts to examine the three hypotheses of the study. One conceptual model and one organizational level model were introduced, the conceptual model measures single units of analysis and the organizational level model measures team level units of analysis. Both models were tested in the empirical survey study. The goal of this chapter is to introduce the exploratory research, hypotheses and the proposed conceptual model that was derived from the exploratory study.

3.2 MI capstone project and MI teams

The MI capstone project was spread over a 12-month weekend-based Masters in Innovation course attended by mostly working adults. The duration of the capstone project was 9 months starting in term 2 to term 4. MI students undertake taught

module courses in the first six months on various innovation topics as a foundation to prepare themselves for the capstone project as shown in Figure 5. Capstone projects kick off in term 2. MI students continued to learn other module topics during term 3 and term 4 to help them in completing the capstone project.

MI teams were formed in term 2. Teams were self-selected by students. MI students were supposed to form their own team and to come up with a project proposal before the end of term 2. Teams were given the freedom to propose any business that they would like to introduce to the market. The project proposal was to be presented to the program director at the end of term 2. They can kick-start their project once they had the approval from the program director. If the project proposal is not approved, the MI team will have to rework and come up with a new proposal. In a few rare cases, the rejected team disbanded, and the members had to join other MI teams.

MI teams were taught the 4 phases of the innovation process. MI teams started the capstone project from Phase 1 idea generation, followed by Phase 2 concept development, Phase 3 product development and Phase 4 launch and market penetration.

At the end of term 3, MI students take part in an international residency for one week at a top US university that specialises in entrepreneurship. This is also the mid-way point of the capstone project. MI teams were to present their capstone project ideas to the entrepreneurship university professors in USA, which will help the MI teams in validating their capstone project with regard to its potential commercial success. MI teams will work on improving their capstone project after they have obtained valuable feedback from these professors.

Figure 5. Master of innovation (MI) program structure

University Terms	Modules			Capstone Project
Term 1. Strategic idea and concept	Module 1 Innovation-focused Strategic Leadership	Module 2 Innovation Strategy Development	Module 3. Ideation Management, Creative Design, Prototyping and Testing of Concepts	
Term 2. Development of Innovative Products, Services, Processes and Business Cases	Module 4 Achieving Innovation Success through people and organisation	Module 5 Innovation Development: Turning concepts into Business Cases	Module 6. Financial Management and New Venture Financing	Capstone Project: Team formation, ideation and present project proposal
Term 3. Market Launch and Successful Commercialisation	Module 7 Market Development and Brand Leadership (including launch Management	Module 8 Commercialising Innovations	Module 9 Supplier and Partnership (Network) management	Capstone Project: Develop product or Services
International Residency	University in USA			Capstone Project: Present capstone project to international lecturers in USA
Term 4. Managing Risk, Sustainable Growth and Values Extraction	Module 10 Business Acceleration and Growth Strategy (Scaling)	Module 11 Risk Management an unstable world	Module 12 Business Sustainability and value extraction	Capstone Project: Final presentation

The end product of the capstone project is a project business plan to launch the new business. MI teams perform a final presentation of their business plan to the program director and external judges at the end of the course. The final presentation format is similar to a start-up presentation or pitching to a venture capitalist in securing seed funding. Alternatively, MI students that are sponsored by companies can select to work on a group innovation project for their employers with the expected outcome to secure funding internally to launch the product or service. The capstone project mimics a live start-up company first stage process leading to securing seed funding. It involves innovation work of ideation, product prototype development and business development. Leadership plays a very important role in this innovation and entrepreneurial process. The first step of the MI capstone team process was team formation and the selection of leader to lead the team. Without a strong entrepreneurial leader to lead the team, teams tend to fall into the trap of the ideation process. Members could not agree on which product or service to select from the various ideas generated by the team. The role of the entrepreneurial leader is not only to lead but he or she will have to execute as well as MI teams are lean with each member contributing to the success of the team. The ability to recognize an opportunity and to lead a team to commercialisation is key to success for an entrepreneurial leader. MI team are expected to create a successful business plan that will help to secure funding required to build the business.

3.3 Qualitative research design

A mixed method of qualitative and quantitative approach was used to examine the phenomenon. First, an exploratory interview was chosen to gain insights into different MI innovation teams. Exploratory research was chosen because of the

possible multidimensional causes of the innovation outcome and success. The focus of the research was on the impact of leadership on teams. An in-depth, semi-structured qualitative interview was best suited as the respondent will be guided towards topics on leadership related impact on the team. Interviews allow the researcher to capture more insights and comments as compared to a quantitative survey. Qualitative research is also more appropriate for capturing perceptions of a person's experience in this study, and the MI team members' perception of their leaders. The objective of the exploratory research was to identify variables and its association and create a conceptual model to represent the association of these variables. This was followed by a quantitative survey to test the model as discussed in Chapter 4

3.4 Exploratory study - Interviews

3.4.1 In-depth interviews with MI team members and leaders

The foundation of this research is provided by several in-depth exploratory interviews with MI graduates representing different capstone project teams, i.e. those who won awards, those who passed the program, and those who dropped out of the course to pursue other ventures as shown in Table 2. Categorising the MI teams into these three categories allows us to capture insights from three different perspectives on innovation success and the innovation work behaviour from each category.

Table 2. Profile of interviewees

Name	Team	Team	Role
Interviewee 1	Award winning team	A	Leader
Interviewee 2	Award winning team	A	Member
Interviewee 3	Average team	B	Leader
Interviewee 4	Award winning team	C	Member
Interviewee 5	Drop out	D	Member

Exploratory in-depth interviews were conducted with 5 graduates of the MI program. The interviewees' profile was selected based on their roles in the MI teams. Students from award-winning teams were selected to understand how they perceived their own success in creating innovative outcomes. Students from average teams and drop-out students were selected to understand their limitations and challenges in creating innovative work behaviour and outcomes. Team leaders and members were selected for the interviews from the same group to obtain information about their leader and member perspectives.

Semi-structured, open-ended questions on leadership, team climate, project experiences and appreciation of age diversity were asked; the interview questions can be found in Appendix 1.

3.4.2 Interview data collection

The names of the interviewees were recommended by the program director based on their capstone projects and team roles. The contact information was retrieved from the university alumni association after the research was cleared by IRB. A phone call and email were conducted to arrange for the interview. Interviews were conducted separately with each interviewee. The interviews were conducted either at their workplace or in a cafeteria near their workplace. The duration of each

interview was about 45 to 60 minutes. All the interviewees signed the IRB consent form before the interviews were conducted. Interviewees were asked prior to each interview for permission to record the conversation. Each recorded conversation was transcribed after the interview by the researcher. All interviews were conducted by the researcher. One respondent was unable to meet up and the interview was conducted by telephone.

3.4.3 Interview insights

Data of the interview was coded into Nvivo for storage and better analysis. Leadership, team climate and commercialization challenges were topics that came up repeatedly during word keyword search on success and challenges. The interview findings provided the researcher with a better understanding of critical factors that help in creating successful capstone projects. More insights were gathered through open-ended questions at the end of the structured questions session. The output of the interviews was used to create the proposed conceptual model. Interview quotes and insights are discussed below.

3.5 Interview findings and Hypotheses

Based on our initial literature review and qualitative findings, Renko's ENTRELEAD scale was identified and used to understand the entrepreneurial leadership topics. During the exploratory interviews, the respondents were asked questions based on the scale as shown in Table 3.

Table 3. Renko's ENTRELEAD scale (Renko et al., 2015)

Renko's ENTRELEAD scale
In the following set of questions, think of your immediate manager (or team leader). How well do the following statements describe him / her? (If you have many immediate managers, please pick one):
1. Often comes up with radical improvement ideas for the products / services we are selling
2. Often comes up with ideas of completely new products / services that we could sell
3. Takes risks
4. Has creative solutions to problems
5. Demonstrates passion for his / her work
6. Has a vision of the future of our business
7. Challenges and pushes me to act in a more innovative way
8. Wants me to challenge the current ways we do business

If leaders fail to lead a team towards the successful commercialization of innovative business ideas qua attractive business products or services, a start-up will not be successful (Renko et al., 2015). Besides the need for effective ideation and

opportunity recognition, execution is important, too, as stressed by the leader of an innovation team that discontinued after graduation:

> *"I think the successful part is that as a team we came together and created a business idea that has an impact on the society… We saw a need and tried to come up with a business idea to solve it. The conceptualisation was good but what I felt was not good or unsuccessful was the execution part. How do you take an idea and make it into reality? That was the part where we stumbled, so it didn't end so well".*

Asked how well some of the ENTRELEAD scale items describe her such as 'coming up with radical ideas for new products/services' or the need to 'challenge and push team members to act in a more innovative way', she replied ("No – team") that this was a collective effort rather than based on individual competency. However, with regard to other scale items such as 'risk-taking' or 'demonstrating passion for the work', she answered in the affirmative. Eventually, her capstone group project came to an end after graduation because "we didn't find it feasible". Team members moved on to other challenges.

Strong entrepreneurial leaders have a clear vision of how to lead the team toward commercialization and the ability to get the team to work well together by accepting comments from all members. This was shown during the interview with the leader from a successful team that won awards in a competition.

> *"I lead more of trying to push the team forward in terms of doing certain things and hitting milestone. For example, at this junction we need to sell*

this concept to the investors. We will have a discussion and I will try to drive the discussion towards that. Everyone will give their view John will take down all their views in pointers and we will try to execute based on that."

In view of the importance of entrepreneurial leadership for capstone project success, the following was hypothesized:

Hypothesis 1a: Entrepreneurial leadership has a positive impact on innovation work behaviour.

Hypothesis 1b: Entrepreneurial leadership has a positive impact on innovation team outcomes.

Most successful start-ups are created by a group of individuals rather than one person alone. In our research, we were baffled by the varied experiences of capstone project teams ranging from those who received external funding or won competitions to those who failed to create sustainable new venture successes. We have categorised the MI teams into (i) average (mediocre), (ii) award-winning teams and (iii) drop-outs.

Average teams

Average teams are teams that passed the general requirements of the capstone course but did not win any awards. These teams arguably had somewhat mediocre (incremental) business ideas and were not always able to demonstrate how they would commercialize the outcome of their projects in a sustainable manner. Often these teams had a common profile in terms of age and educational background, i.e. they were less diverse than others. As one of these team leaders stressed, a key

challenge for such groups lies in the area of commercialization. Students were guided to master the commercialization process during the course through lectures, case discussions and guest presentations. They also had to repeatedly pitch their proposals to professors and outside consultants during the capstone project phase. While entrepreneurial training was provided, something was arguably lacking amongst these teams, namely strong entrepreneurial (team) leadership. When asked about the importance of leadership for innovation success in general, one interviewee reflected about her shortcomings and associated struggles:

> *"Was I radical in my thinking and did I challenge my team member as their leader? I think that is where as an entrepreneur I have weaknesses. I don't challenge or push enough. Whereas I look at my current boss, he always thinks about more radical stuff and always challenging and pushing us on how things can be done. I think that is very critical for any leader in business."*

The word diversity often came up during the interviews. As one respondent argued, more homogenous groups (in terms of age) seemingly spent more time during the ideation process creating new ideas but lacked focus when it came to create an innovative outcome that could be commercialized. More diverse groups appeared to be less creative but more effective in terms of execution:

> *"In the all senior and diverse group, the idea seems to be more rigid or less creative, but their execution is very good. I look at the younger group,*

perhaps there is more creativity, but the execution doesn't seem to be so good."

Award-winning teams

Award-winning teams refer to MI teams that stood out in terms of their competitive entrepreneurial orientation. These teams were diverse in terms of age, education and work experience. Reflecting on their success, one team member talked about the diversity of the group in terms of disciplines represented and the importance of leading groups in creating an innovative outcome:

"We have a team of diversity experts. We have a medical engineer; we have a strategic planner, an IP consultant and me as a design consultant. We have a hardware and software engineer. Diverse in skillsets and diverse in age ranging from 24 to 42. It is really rewarding as we get to be exposed to different trains of thoughts, different perspectives and also different kinds of expertise - that is why it was rewarding to me".

It was emphasized that there was a positive team climate in the team and that members appreciated each other as well as their different educational backgrounds.

"We do have a high appreciation for people from different age groups. From an entrepreneurial journey perspective, not everyone from different age groups has the same drive. First thing, when some of the older ones get tired, the younger ones can take on the load. To the young it's something new they want to try. Second thing, it is about experience, the older people

in the group have gone through a lot of mistakes. We can actually advise the younger guys in the team so that they will not take the long road to discovery and they really appreciate that."

Drop outs

Very few team members had dropped out from the course in order to start their own company or to join an established firm as employees. One of them reflected about his struggle working with younger team mates, stressing that he preferred a less diverse group to reduce infighting:

"Senior people are able to handle diverse ideas better than young ones. I see people in their 30s who are more mature and more open to accept different ideas. Even if there are debates, we always come to an agreement but for large age diverse teams I see a lot of debates and people get into fights. The results were not so satisfying in those groups."

Diversity in groups can be helpful in terms of ideation and problem solving as such groups are able to create solutions from diverse ideas and backgrounds. But diverse voices can also cause conflict and in-fighting. As a result, the overall team climate may suffer, and a negative tone may appear in team discussions. Another respondent pointed out that leadership is important to ensure that diverse groups perform well but in reality, he often observed the opposite happening:

"The thing is different people have different ideas. How can you maintain democracy? Allow different people with different ideas but centralize the

idea and consolidate it to move forward. I saw many cases where discussions are going on forever. The team couldn't align, and I agree it is very important to have a leader."

An interesting observation which emerged in the course of the MI program is the notion that particularly successful student teams (e.g. as evidenced by cash awards they received) often comprised very diverse team members in terms of social and expertise diversity in age, education and working experiences. The overall importance of team diversity was highlighted by several graduates of the MI program. As a member of a diverse award-winning team pointed out:

"I must say diversity does help because of our different ages and experiences. It provides some dynamics. You can see that Jay is very energetic. He will do things after midnight. Ron is in his mid-30s and still very energetic. Ken is a bit more laidback. He has his ideas but let us take the lead on different things. We will throw a lot of ideas at him, and he will say 'yes workable'- then we will proceed. Me and Ben are in our late 40s. We are more stable. We try to balance enthusiasm and creative ideas versus the practical aspect."

Without an entrepreneurial leader able to push the innovation idea forward and to nurture a positive team climate, groups may never become 'real' teams and as a result may suffer from lack of focus and execution. This concern was apparent in our conversations with MI graduates.

Team member skill sets and confidence in the entrepreneurial process play an important role in the success of entrepreneurship. If members in the team have low entrepreneurial self-efficacy this will have a negative impact on team climate, as some members will fail to contribute in the start-up process due to lack of confidence and skill sets. Team members face frustration, which in turn affects team climate. This can be seen by the interview with the leader of an average team:

> *"What I am going to say is there are times when I can feel the frustration. For example, there are certain things that I will assume that everybody knows how to do. For example, to present or to do a presentation. Perhaps for them they don't do it often. They will spend a lot of time to rehearse line by line. I will be thinking, 'Why do you need to do that over and over again? I see this as a waste of time. I think they can see this is the frustration I have with them."*

A good entrepreneurial leader will be able to lead members with different entrepreneurial self-efficacies and create a positive environment. The leader of the award-winning team reflected on how he encouraged members with different entrepreneurial self-efficacies to contribute during discussions.

> *"I try to be balanced because I know Joe sometimes has his ideas, but he does not dare to speak up. I understand because I have people under me. When we have a meeting, I will go around and make sure everyone has the time to speak up. No matter right or wrong, just speak up. This encourages the team to have different voices."*

On the other hand, strong entrepreneurial self-efficacy might also cause conflict and tension in the team as members have strong individual opinions during the start-up process. A strong entrepreneurial leader is needed to create a positive team climate for a team of high entrepreneurial self-efficacy members. As an interviewee pointed out, leaders of smart people must create a good atmosphere.

> *"Like what I said earlier, you empower people to openly speak and brainstorm, but on the other hand, I see the negative of constant discussion even leading people into fighting with each other. In this case, leadership is very important. If you have smart people, it's not easy to do team work. The leader needs to pull them back and create a good atmosphere."*

Entrepreneurial leadership is essential in creating a positive team climate in high entrepreneurial self-efficacy teams. To make innovation work effectively across various members requires the willingness to understand what everyone's expectations and points of view are right at the start of the journey which could be a job interview to recruit a team member or an initial brain-storming session. In an innovation environment the team members are encouraged to constantly challenge ideas and improve them through prototyping. This might cause conflict and effect team climate without a strong leader to lead them the start-up process might fail. Therefore, we hypothesize that a strong entrepreneurial leader and entrepreneurial self-efficacy and the appreciation of age diversity will have a positive effect on the team climate of an innovation team.

Hypothesis 2a: Entrepreneurial leadership has a positive effect on team climate.

Hypothesis 2b: Appreciation of age diversity has a positive effect on team climate.

Hypothesis 2c: Entrepreneurial self-efficacy has a positive effect on team climate.

While diversity is generally seen as an asset when it comes to ideating diverse and innovative ideas, it can also make innovation harder to work or cause conflicts with negative effects on team climate unless a 'strong' entrepreneurial leader steps in who is able to achieve a high degree of team identification qua a positive team climate which in turn is beneficial for a high degree of group / team effectivity and high-quality innovation outcomes.

Our interviews suggest that a key factor is how motivated and satisfied team members are, both individually as well as collectively. As another graduate pointed out:

> *"The satisfaction level in itself tells you how much efforts are put in to churn out the solution. It also tells you how strong the dynamics of the team are when members are dealing with issues. Sometimes, success is dependent on sheer luck of having 'like-minded' personalities that can work with one another. Sometimes, it is due to the charm of the overall leader in the group or sub-group, and at times it is also due to the fact that the process of getting the job done was developed and approved collaboratively".*

Positive team climate is found to have a positive effect on team results as members have a sense of direction, are motivated, feel safe and constant communication in

the team. The team leader's role is critical in nurturing a positive team climate (Anderson & West, 1998).

In view of the importance of a good team climate for team success, teams with poor team climates might not be able to create an innovation work behaviour. We hypothesise that a strong entrepreneurial leader will be able to create a positive team climate, which in turns create a positive innovation work behaviour in innovation team.

Hypothesis 3: Positive team climate has a mediating effect on entrepreneurial leadership impact on innovation work behavior.

3.6 Towards a Model

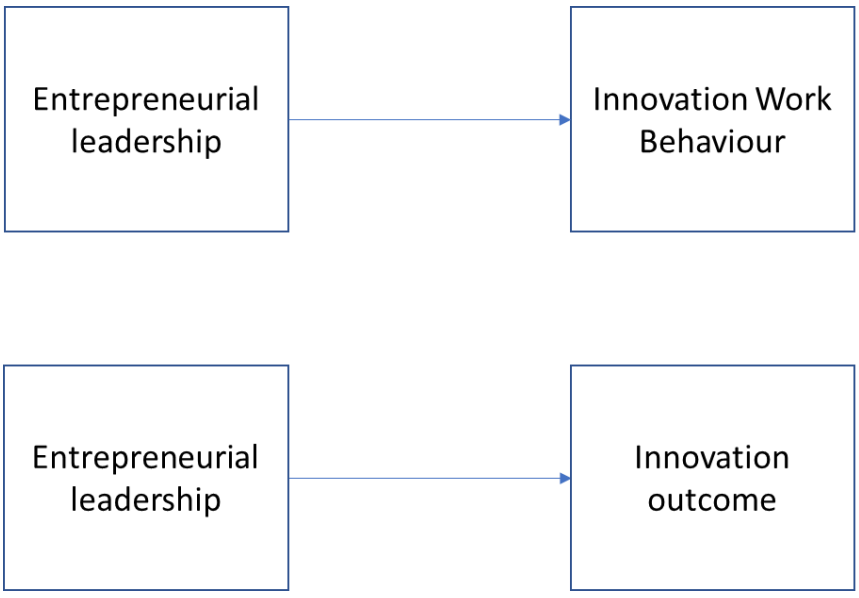
Based on the hypotheses and analysis, one conceptual model and an organizational level model were proposed for creating/predicting a successful innovative work behaviour and innovation outcome by a team that undertakes a start-up activity as shown in Figures 9 and 10. The proposed conceptual model measures a single unit of analysis of individual members entrepreneurial leadership impact on innovative work behaviour. The proposed organizational level model measures team level unit of analysis of MI team's entrepreneurial leadership impact on team innovation outcome capstone project score. The capstone project score will be explained in Chapter 4. To better examine the hypothesis and the mediating effect, the proposed conceptual model is shown in 3 parts based on the three hypotheses in Figures 6, 7 and 8 for explanation.

Hypothesis 1a: Entrepreneurial leadership has a positive impact on innovation work behaviour.

Hypothesis 1b: Entrepreneurial leadership has a positive impact on innovation team outcomes.

Part 1, Hypothesis 1a and 1b: Entrepreneurial leadership plays a vital role in a successful innovation team, helping to create a positive innovation work behaviour among team members as a leader and doer of entrepreneurial activities. Entrepreneurial leadership also has a positive effect on innovation work behaviour and innovation outcomes in terms of successful capstone project in MI teams. We posit that entrepreneurial leadership has a positive effect on innovation work behaviour and team entrepreneurial leadership has a positive effect on team innovation outcomes as shown in Figure 6.

Figure 6. Part 1 - Entrepreneurial leadership has a positive impact on innovation work behaviour and innovation team outcomes. (hypothesis 1a and 1b)



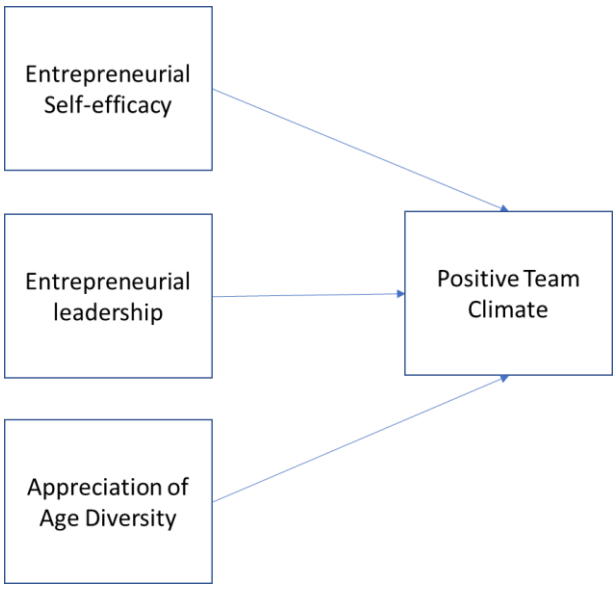
Hypothesis 2a: Entrepreneurial leadership has a positive effect on a positive team climate.

Hypothesis 2b: Appreciation of age diversity has a positive effect on a positive team climate.

Hypothesis 2c: Entrepreneurial self-efficacy has a positive effect on a positive team climate.

Part 2, Hypothesis 2a, 2b and 2c: In a successful innovation team, members should ideally experience and benefit from strong entrepreneurial leadership while in reality members' capability to do so may vary due to differences with regard to their self-efficacy, age, educational and/or work experiences. We posit that entrepreneurial leaders with strong entrepreneurial leadership, entrepreneurial self-efficacy and an appreciation of age diversity will be able to nurture a positive team climate as shown in figure 7.

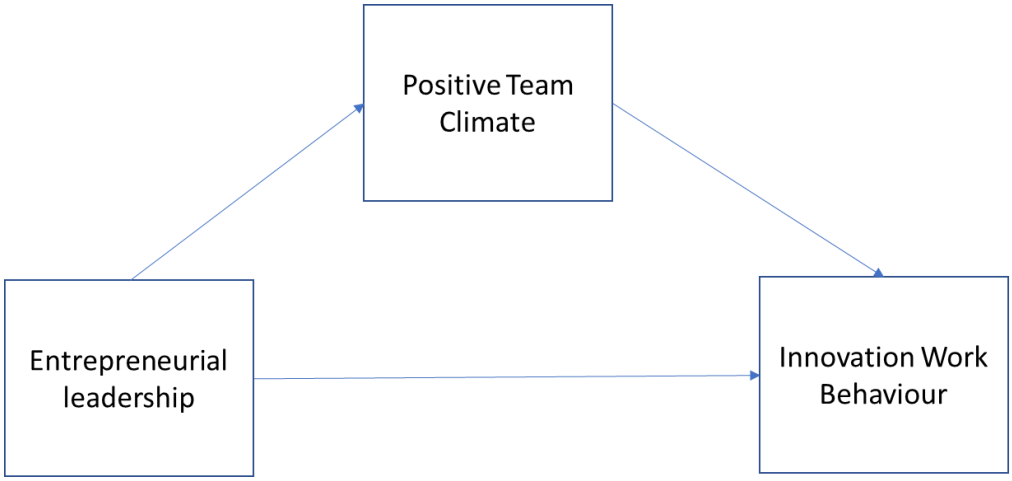
Figure 7. Part 2 - Entrepreneurial leadership as driver of positive team climate with entrepreneurial self-efficacy and appreciation of age diversity (hypothesis 2a,2b,2c)



Hypothesis 3: Positive team climate has a mediating effect on entrepreneurial leadership impact on innovation work behavior.

Part 3, Hypothesis 3: Positive team climate will have a mediating effect on entrepreneurial leadership impact on innovation work behaviour. We posit that a team with a strong entrepreneurial leader will be a good predictor of innovation work behaviour mediated by a positive team climate as shown in Figure 8. Entrepreneurial leaders help lead and challenge members to work in an innovative way. This is mediated by a positive team climate, members from a positive team will be motivated to perform innovation work.

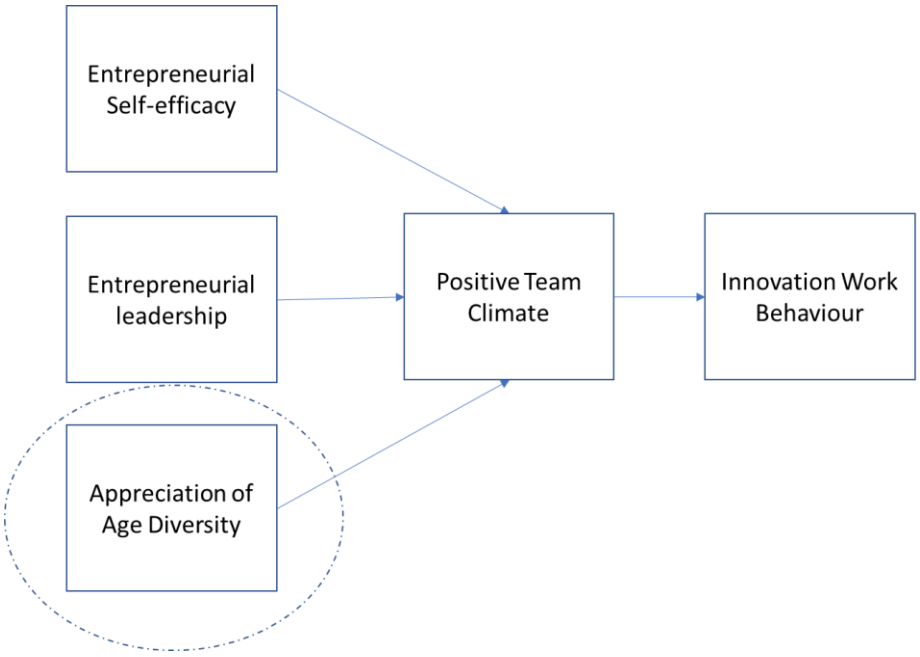
Figure 8. Part 3 – Positive team climate mediates the effect of entrepreneurial leadership on innovation work behaviour (hypothesis 3)



Proposed conceptual model (single unit of analysis): Entrepreneurial leaders with strong entrepreneurial self-efficacy and an appreciation of age diversity will be able to nurture a positive team climate that will be a good predictor of innovation work behaviour as shown in Figure 9. Based on prior case study research by others, age

diversity in teams impacts innovation work behaviour and outcomes (Menkhoff, 2015). During our exploratory study, we could not ascertain a direct effect between appreciation of age-diversity with innovation work behaviour and innovation outcomes for all teams. But award-winning teams with diverse age groups did practice appreciation of age-diversity resulting in a positive team climate. We intend to test this in our empirical studies. The dependent variable centres around the innovation work behaviour of individual team members. Without innovation work behaviour, team members will not be able to create successful innovation outcomes.

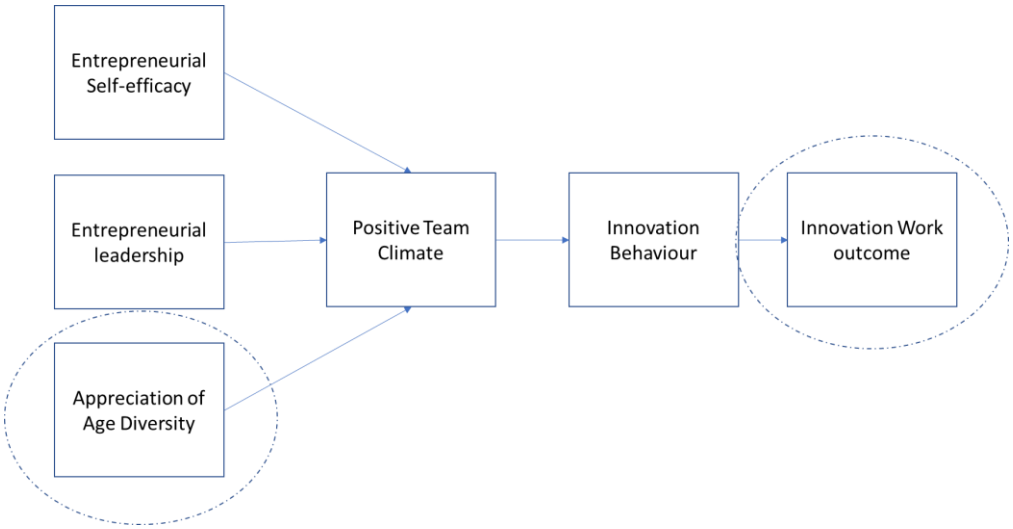
Figure 9. Conceptual model - Entrepreneurial leadership with strong entrepreneurial self-efficacy and appreciation of age diversity as driver of positive team climate and innovation work behaviour



Proposed organizational level model (team unit of analysis): An MI team is similar to a start-up company comprising a group of individuals with three to five members.

The outcome produced by the team is the capstone project just like a product introduced by a start-up company. In the organizational level model, entrepreneurial leadership in the team effects the team's positive climate that in turn creates positive team work behaviour, and that effects innovation team outcomes as shown in Figure 10. Both models will be examined in Chapter 5.

Figure 10. Organizational model - Entrepreneurial leadership with strong entrepreneurial self-efficacy and appreciation of age diversity as driver of positive team climate and innovation work behaviour/outcomes



3.7 Summary

This chapter introduced the MI teams and the capstone project. This was followed by the exploratory interview study, the hypotheses and the proposed conceptual framework for this study. The research was centred around examining the effects of entrepreneurial leadership on innovation teams. Three hypotheses were derived from exploratory qualitative interviews with members of MI teams. A conceptual model and an organizational level model were proposed for single and team level

analyses. The next step was to create a quantitative survey to test these models as shown in Chapter 4.

Chapter 4 - Method

4.1 Introduction

This chapter introduces the quantitative research method used in the study of entrepreneurial leadership impact on innovation work behaviour and outcomes. This research uses a mix method approach of qualitative and quantitative research. The research starts with an exploratory qualitative interview with the MI teams to capture key antecedents that can predict innovation work behaviour and outcomes. The conceptual model, organizational level model and hypotheses were derived after the qualitative exploratory research as discussed in Chapter 3. This was followed by a quantitative survey to test the hypothesis and models. In this chapter, the quantitative research design, quantitative study, measurement instruments, research sample, units of analysis, data collection and data analysis are discussed.

4.2 Quantitative research design

In order to test the hypotheses and conceptual model, a quantitative survey method was used. Quantitative survey is the most commonly used method in business research for examining associations between construct variables. Established and tested measurement instrument scales reviewed in the literature review were used to create survey questions. By using established instrument scales, the research results can be generalized, and the research can be repeated and extended by other scholars. There will also be no validity issue as the measurement scales used are established scales tested by other scholars. The survey results were entered into SPSS and hierarchal regression analysis was conducted to examine the effect of the construct variables. The mediation effect was tested using the Baron & Kenny

approach (Hayes, 2009). Sobel test (Sobel, 1982) and Preacher & Hayes' bootstrapping approach (Preacher & Hayes, 2004) were conducted to confirm the mediation.

4.3 Quantitative study survey

4.3.1 Sample of the study – MI teams

This study was based on the reported challenge of MI teams in producing successful innovative capstone projects / innovation outcomes. This is a unique opportunity for the researcher to examine start-up teams' leadership matters, innovation work behaviour and innovation outcomes. The population of the study is restricted to the population of MI graduates. In 2017, there was a total of 160 MI graduates representing 5 programme years (MI was started in 2012). Average cohort size was about 30 to 40 each year. The average age of the MI students was about 30 years and the average work experience was 7 years. The oldest student was 59 years old and the youngest was a fresh graduate at 21 years old. 60% of the students were male and 40% of the students were female. In terms of nationality, it varies each year. At the start of the program, there were more locals and in 2015 only 20% of the students were local. On average during the last 5 years, 50% were international students working in Singapore and 50% were local students. There were 10 to 20% scholarship holders from the army in each cohort. The average size of the MI teams varied; average team size was 2 to 6 members. The MI program is a weekend-based program, classes were run during the weekend, and 90% of the MI students were working during the course.

Due to the nature of the survey research as a reflection and perception of their experiences of the capstone projects, graduates of more than 3 years were

eliminated for selection. This eliminated bias as it would have been difficult for the graduates to remember and reflect about MI if their graduation was more than 3 years ago. 50% of the graduates were also international students and it was difficult to contact them for the survey. Some of these graduates might have relocated back to their home countries. All this reduced our final sample to 108 graduates.

4.3.2 Survey measurement scale

With the interim findings, a quantitative research survey was created to examine the various variables. The survey questions were derived from established research scales.

The entrepreneurial leadership (Renko et al., 2015) scale was used to understand entrepreneurial leadership in the teams by asking team members questions about their team leader in fostering innovation by the team (*"challenges and pushes me to act in a more innovative way"),* **team leader creativity** (*"often comes up with radical improvement ideas for products/services we are selling"),* **risk taking** (*"Is willing to take risks for new projects")* and **vision of future business** (*"Has a vision of the future of our business"*.) The 5-point Likert scale answers come with options from 'strongly agree' to 'strongly disagree' for questions about their leader's entrepreneurial leadership.

Entrepreneurial self-efficacy (McGee et al., 2009): McGee's 19-item ESE scale was adapted with measurements of team members' own entrepreneurial self-efficacy in a start-up process with questions that are based on an entrepreneurship process of **searching** *("How much confidence do you have in your ability to brainstorm [come up with] a new product or services?"*), **planning** *("How much confidence do you have in your ability to estimate the amount of start-up funds and working capital*

necessary to start your business?") and **marshalling** (*"How much confidence do you have in your ability to get others to identify with and believe in your vision and plans for a new business?")* that mimic a start-up process. The 5-point Likert scale answers come with options from very little to a lot/very much for questions about their own entrepreneurial self-efficacy.

Team climate (Anderson & West, 1998) was adapted from the 38-item team climate inventory scale TCI from Anderson and West (1998). This scale measures the multi-level construct of a positive team climate in an innovative environment with questions on **team vision** (*"How clear are you about your team objectives?")*, **task orientation** (*"Do your team colleagues provide useful ideas and practical help to enable you to do the job the best of your ability?")*, **support for innovation** (*"people in this team cooperate in order to help develop and apply new ideas")*, **participative safety** (*"people feel understood and accepted by each other")*, and **interaction frequency** (*"Members of the team meet frequently talk both formally and informally")*.

The innovation work behavior measurement scale (Janssen, 2000) was adapted to understand the innovation work behavior of the team by asking members questions on **innovation creation** ("Our team creates new ideas for difficult issues"), **cultivating innovation** *("We make important organizational members enthusiastic about innovative ideas")*, **implementing innovation** *("Our team transforms innovative ideas into useful applications")*, **and innovation work behaviour** *("We introduce innovative ideas into the work environment in a systematic way")*.

As part of the age diversity research another measurement scale was incorporated in the survey. Questions about appreciation of age diversity adapted from the

Wegge et al. (2011) scale (Wegge et al., 2011) was also asked in the survey. A sample of the survey questions can be found in Appendices 2.

The innovation outcome was a shared team achievement among members from the same team. Unfortunately, there were no final grade scores for the MI capstone projects available as the emphasis of the program was in educating the students in innovation and creating innovation capstone outcomes. Projects were graded on a pass-fail basis. A poor grade required rework and could lead to graduation delays.

The innovation outcomes were measured based on the objective goal attainment scores of the capstone project-related assessment scores provided by external judges in the final presentations. These scores were obtained during the final project presentations (10 minutes presentation plus 10 minutes Q&A) scheduled at the end of each program cycle. Judges, Faculty and other experts acting as judges provided feedback. Figures 11 and 12 contain the Feedback Sheet (rubrics) which has been used in the program for assessing the final capstone project presentations based on altogether on 5 evaluation criteria. These feedback forms were retrieved from the program director and the scores were tabulated for each group.

Figure 11. Rubric for assessment of MI capstone project part 1

Evaluation Criteria	Level 1 (Poor)	Level 2 (Average)	Level 3 (Good)
Definition & Understanding of Business Opportunity (incl. Business Case and Customer Value Proposition)	Not able to define the business opportunity, incl. business case and customer value proposition	Business opportunity (incl. business case and customer value proposition) has been satisfactorily defined	Business opportunity (incl. business case and customer value proposition) has been very well defined
Differentiation with regard to innovative Business Model/Plan, Product/Service Design (clarity of prototype) and Technology (e.g. vis-à-vis leading competitors)	Unable to come up with a differentiated, innovative and competitive business model / plan, product / service design prototype and technology (vis-à-vis leading competitors)	Team has come up with a (mediocre) business model / plan, product / service design prototype and technology	Team has come up with a differentiated and innovative business model / plan, product / service design prototype and technology that is superior (e.g. with regard to leading competitors)
Market Potential & Viability of Go-to-Market Strategy, incl. anticipated Market Acceptance	Fails to provide any data / evidence for market potential and a viable go-to-market strategy	Some attempts have been made to provide data / evidence for market potential and a viable go-to-market strategy, but gaps remain	Team has provided solid data / evidence for market potential and outlined a viable go-to-market strategy

Figure 12 Rubric for assessment of MI capstone project part 2

Evaluation Criteria	Level 1 (Poor)	Level 2 (Average)	Level 3 (Good)
Overall Quality of Capstone Project Team in terms of Knowledge, Passion, Determination and Team Dynamics	Overall poor quality of Capstone Project Team in terms of knowledge, passion, determination and team dynamics	Overall quality of Capstone Project Team in terms of knowledge, passion, determination and team dynamics is satisfactory	Overall quality of Capstone Project Team in terms of knowledge, passion, determination and team dynamics is good
Clarity and Effectiveness of Presentation Delivery, incl. Quality of Q&A	Presentation delivery, incl. quality of Q&A is substandard	Presentation delivery, incl. quality of Q&A is adequate but can be further improved	Effective presentation delivery, incl. quality of Q&A

4.3.3 Unit of analysis

The unit of analysis measured in this study is a multilevel concept of individual/single and organization/team analysis. 'Single' being individual MI team members and leaders and 'organization/team' being different MI teams. MI teams were similar to a start-up company in terms of an organization unit. Entrepreneurial leadership theory has been used in examining individual and organization level association with other variables (Leitch & Volery, 2017). Entrepreneurial leadership, entrepreneurial self-efficacy, team climate and innovation work behaviour are single units of analysis. They were the shared perceptions of members in their experiences in the teams. In the survey research each team member reported their reflections on these variables. Innovation outcomes are a measurement of team units as each MI team will have the same innovation outcome in terms of the capstone project's outcome. The conceptual model as shown in Chapter 3 is a single unit of analysis. The organization level model (also shown in Chapter 3) is a team unit of analysis. The challenge of this study lies in the team unit of analysis of the variables' association with innovation outcomes as discussed in Chapter 5.

4.3.4 Data collection for survey

For the survey, physical survey forms and online Google survey forms were created and sent to graduates of the MI program. Capstone project reports and project evaluation forms were also collected for analysis of the innovation outcomes.

An online and paper survey was developed after the research was approved by the IRB. For the online research IRB digital signature was added to each survey, participants needed to acknowledge before they can proceed with the online survey. The online survey was sent to 108 students from the past 3 years of graduates of the

MI program 2015 to 2017 via their email addresses retrieved from the alumni association. A tie-in with an innovation book launch event was added to the online survey as reward for completing the survey. No monetary award was given for completion of the survey. The response rate was 46%, (50 persons responded to the survey). Most of the respondents were from the recent 2017 cohort. Only 1 respondent was from the cohort of 2015 and since the survey was half completed, it was deleted from the final sample. The researcher tried to use the snowball effect to encourage more responses by getting cohort class representatives to share the online survey link to their ex-classmates through their alumni WhatsApp chat group. That helped to increase the survey participation. The response was still low from international students. This could be due to international students' relocation or loss of interest in association with any research study about the MI program.

Survey results were recorded into excel and input into SPSS for analysis. Reversed coding was conducted for questions on appreciation of age diversity. The means for the multilevel constructs for team climate, innovation work behavior and appreciation of age diversity were computed to represent each variable in the analysis. Based on recommendations by VanVoorhis & Morgan (VanVoorhis & Morgan, 2007), the minimum size for regression of 50 was achieved for running the regression study.

4.4 Data analysis

Regression analysis was used to examine the predictor for hypothesis 1a and 1b. Hierarchical regression analysis was used to examine the significant of the different predictors on the dependent variable for hypothesis 2a, 2b and 2c. The Baron & Kenny approach (Hayes, 2009) was used to examine the mediation effects for

hypothesis 3. Sobel test (Sobel, 1982) and Preacher & Hayes' bootstrapping approach (Preacher & Hayes, 2004) were used to confirm the mediation effect.

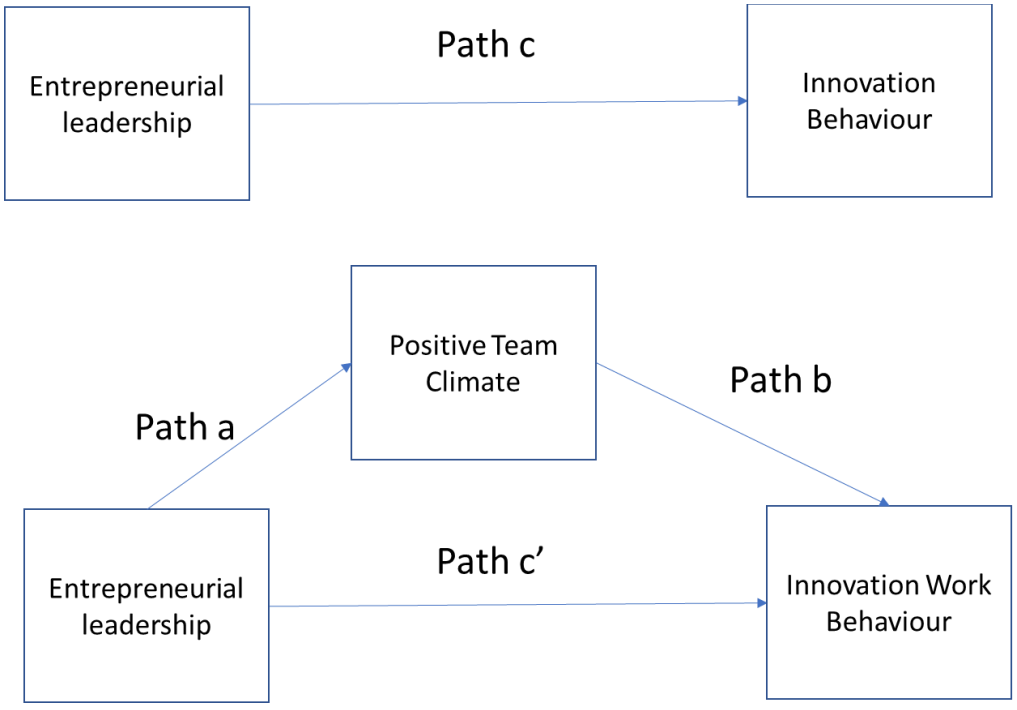
Regression analysis examined the effect of the predictor variable on the dependent variable. For Hypothesis 1a and 1b, the predicator entrepreneurial leadership impact on the outcome variable innovation work behavior and innovation outcome were tested in the regression analysis. Results are shown in chapter in Chapter 5.

In the hierarchical regression, four different models were created for each of the independent variable, the models' statistically significant amount of variance on the dependent variable were compared after accounting for all other variables. For hypothesis 2a, 2b and 2c hierarchal analysis, each variable is entered in the hierarchical regression in level of importance to create a model. Step 1 – model 1, control variables were entered first, demographics variables student age and student gender were used as control variables. Demographics variables were used as control variable to reduce the effect of demographics influence in the regression. Step 2 – model 2, appreciation of age diversity was entered. Step3 – model 3, entrepreneurial self-efficacy was entered. Step 4 – model 4 entrepreneurial leadership was entered. The models were compared on its significant effect on the dependent variable team climate.

For hypothesis 3, a hierarchical analysis was conducted first to examine possible effect of mediation. Step1 – model 1, entrepreneurial leadership was entered. Step 2 – model 2, team climate the potential mediator was entered last. The outcome variable for hypothesis 3 was innovation work behavior. At step 2, if team climate is the mediator it will change the effect significantly for entrepreneurial leadership on team climate. The Baron and Kenny approach was conducted to test the

mediation. In Baron and Kenny's method, four paths of the association of the independent variable, mediator and dependent variable were tested with a regression analysis as shown in Figure 13. A simple regression analysis was conducted for the first three paths and a multi regression was conduct on the last path. Path A, the independent variable needs to predict the mediator. Path B, the mediator needs to predict the dependent variable. Path C the independent variable needs to predict the dependent variable. Last path C', independent variable and mediator were entered into a multi regression to predict the dependent variable. If the independent variable is no longer significant when mediator is controlled, full mediation occurred. Two more tests were conducted to confirm the mediation. A Sobel test, a t-test on the indirect effect of the mediation was conducted. Preacher & Hayes bootstrapping approach was also conducted by random resampling the sample size to 5000 to test the mediation effect.

Figure 13. Baron and Kenny method mediation path



4.5 Summary

In this chapter the quantitative survey was discussed. Established measurement instruments on entrepreneurial leadership (Renko et al., 2015), team climate (Anderson & West, 1998), entrepreneurial self-efficacy (McGee et al., 2009) and appreciation of age diversity (Wegge & Schmidt, 2009) were used to design the questionnaires and the units of measurement used were single unit of analysis for conceptual model and team unit of analysis for organizational level model. Regression and hierarchical analysis were used to test hypothesis 1 & 2. Baron & Kenny Approach (Hayes, 2009), Sobel test (Sobel, 1982) and Preacher & Hayes' bootstrapping approach (Preacher & Hayes, 2004) were used to examine the mediation effect of hypothesis 3. The results will be discussed in Chapter 5.

Chapter 5 - Results

5.1 Introduction

This chapter presents the results of the data analysis of the study on entrepreneurial leadership impact on innovation outcomes. The purpose of the study was to examine whether entrepreneurial leadership has a positive impact on team climate, innovation work behavior and innovation outcomes. Descriptive statistics, reliability and validity of the sample, correlations of the variables and the model testing of the conceptual framework are discussed below.

5.2 Descriptive Statistics

For the individual level analysis, a total of 50 complete student survey results were collected. Figures 14 and 15 show the distribution of age and total job experiences of the MI graduates. The average age (mean) of the students collected was 33 years old with 109 months or 9 years of work experience. The youngest student was a fresh male graduate at age 21 and the oldest student was a seasoned entrepreneur at age 59. In terms of gender as shown in Figure 16, 66% of the respondents were males and 34% were females. This is similar to the demographic breakdown of entire MI class cohort. The survey respondents came from diverse industry experiences and backgrounds. 5 students were from an Army scholarship that aims to support army officers' careers after retirement. The most popular industries were marketing and finance as shown in Figure 17. The sample size collected was a good representation of a cohort for the study for individual units of analysis.

Figure 14. MI graduates' age distribution

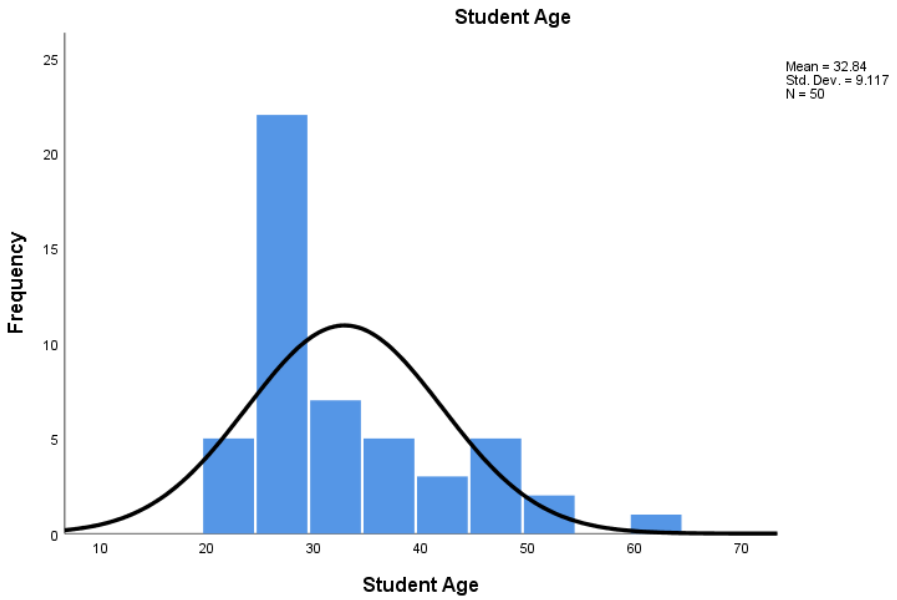


Figure 15. MI graduates' total job experiences in months

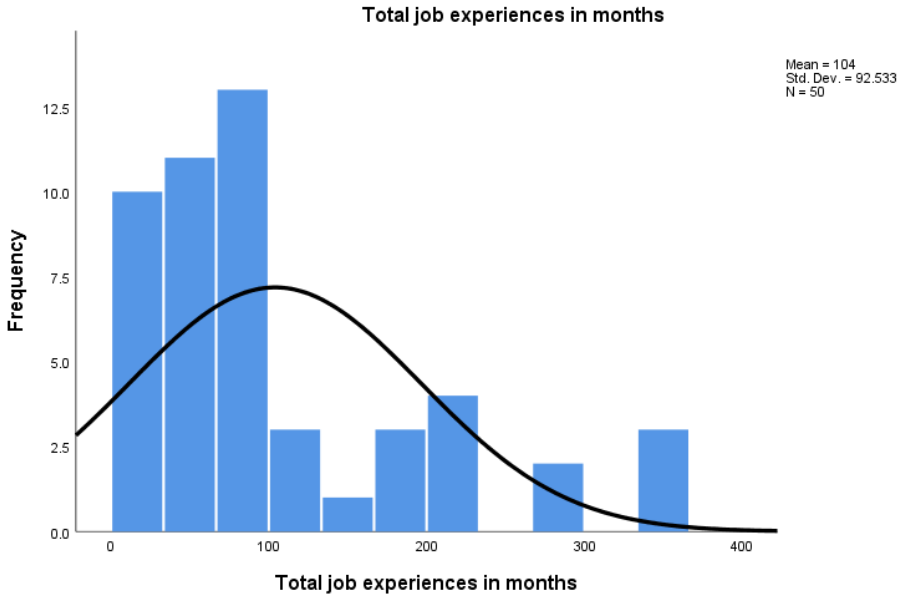


Figure 16. Gender distribution of MI graduates

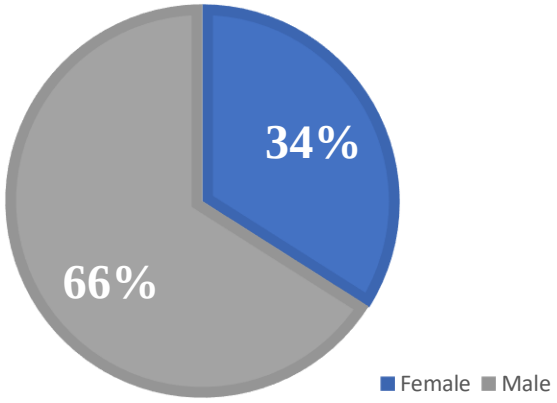
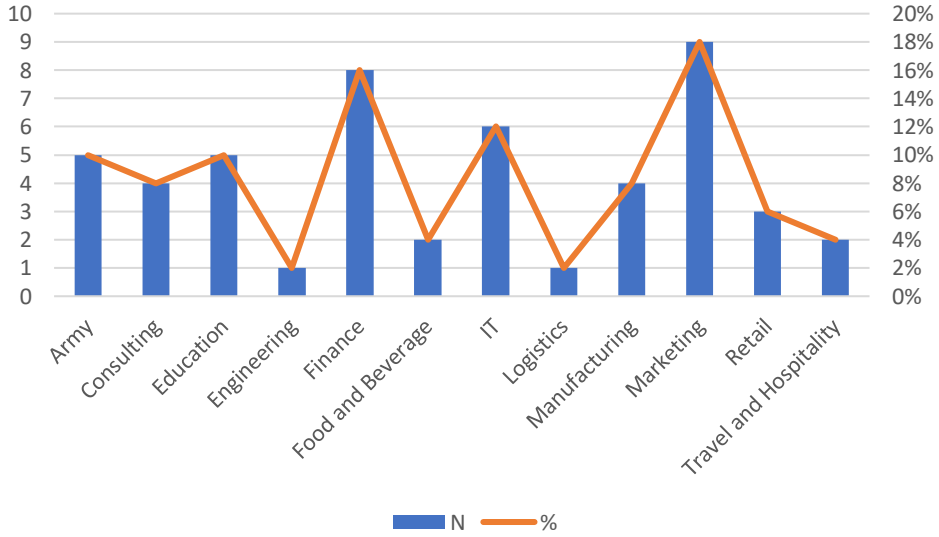


Figure 17. MI graduates' working experiences in industry



A total of 13 teams were examined: 9 complete teams and 4 partial complete teams as shown in Table 4. The existence of partial complete groups could be due to uncontactable members who had left the country as the missing survey replies were all international MI students. For team units of analysis for MI project teams, only 9 complete teams (69%) could be used. The team size for the complete groups were

SD 3.85, Mean 1.28. Total group including missing members were SD 4.54, mean 1.27, as shown in Tables 4, 5 and 6.

Table 4. Mean, standard deviation and mode of MI team members

	Survey collected (N)	%	Total team size	Complete Group	Project score
Team 1	6	12%	6	Yes	75
Team 2	5	10%	5	Yes	83
Team 3	3	6%	3	Yes	64
Team 4	3	6%	5	NO	66
Team 5	4	8%	4	Yes	54
Team 6	3	6%	6	NO	63
Team 7	6	12%	6	Yes	66
Team 8	3	6%	3	Yes	59
Team 9	3	6%	3	Yes	72
Team 10	5	10%	5	Yes	81
Team 11	4	8%	4	Yes	70
Team 12	3	6%	6	No	83
Team 13	2	4%	3	No	72
mean	3.85		4.54		69.85
SD	1.28		1.27		9.06
Total	50	100%	59		

Table 5. Mean, standard deviation and mode of complete MI teams

	Survey collected (N)	%	Total team size	Complete Group	Project score
Team 1	6	12%	6	Yes	75
Team 2	5	10%	5	Yes	83
Team 3	3	6%	3	Yes	64
Team 5	4	8%	4	Yes	54
Team 7	6	12%	6	Yes	66
Team 8	3	6%	3	Yes	59
Team 9	3	6%	3	Yes	72
Team 10	5	10%	5	Yes	81
Team 11	4	8%	4	Yes	70
mean	4.33				69.33
SD	1.22				9.64
Total	39	78%	39		

Table 6. Mean, standard deviation and mode of non-complete MI teams

	Survey collected (N)	%	Total team size	Complete Group	Project score
Team 4	3	6%	5	NO	66
Team 6	3	6%	6	NO	63
Team 12	3	6%	6	No	83
Team 13	2	4%	3	No	72
mean	2.75		5.00		71.00
SD	0.50		1.41		8.83
Total	11	22%	20		

This shows differences in the data representation for measuring the team unit of the innovation outcomes in team score. The most common team size of the 13 teams surveyed, i.e. the mode, was 5 members. The mode for the entire sample was 3. Project scores were not consistent, as there were two different sets of judges for each cohort. For the 3 years of data collected, 6 sets of different expert panel results were used to grade the project score. In the 2017 cohort, the first group of judges rated all groups significantly lower than the second group; this shows bias and inconsistency. Scholars have been using expert panels in grading the performance of team outcomes by reviewing innovation outputs (Davis, 1992). In an expert panel review, innovation reports were sent to a panel of experts from the same field to grade their performance. Another set of expert panel review of the report was considered but introducing another set of panel expert might result in even more bias as expert might have different opinion on the level of innovation outcome based on business plan as no physical products were produced by the MI teams. The new grades might also contradict the current expert panel the researcher decided not to proceed with another expert panel review. A study based on award winning teams were better analyzed through qualitatively case study research as the

outcome of winning an award are multidimensional. A university program on innovation should not be judged by the number of award winners that were produced by it. Success should (also) be judged by the knowledge acquired by students and how that influences their future career and behavior.

5.3 Preliminary Statistical Analyses

5.3.1 Reliability and validity analysis

Cronbach alpha was used to test the internal consistency and reliability of the instrument. For all independent variables the instrument Cronbach alpha were greater than minimum accepted value of 0.7 as shown in Table 7. This shows that all independent variables collected from the scale instruments are reliable. No multicollinearity was found in the independent variables as VIF scores were below 3.1 among independent variables and r was less than 7 and above 3 among independent variables in the correlation analysis showing validity of the instrument as shown in Table 8.

Table 7. Cronbach alpha for independent variables

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
Entrepreneurial Leadership	0.896	0.908	9
Entrepreneurial Self Efficacy	0.908	0.913	20
Team Climate	0.964	0.967	39
Innovation Work Behaviour	0.864	0.890	9
Appreciation of Age Diversity	0.801	0.809	7

The mean, standard deviation and correlation of the measures of all variables are shown in Table 8. Team climate has the highest mean showing most students had a positive experience. Appreciation of Age diversity has the lowest mean as some teams were not diverse, and the importance of appreciation of age diversity was low in those teams. Student age and student gender were used as control variables in the hierarchal analysis. Control variables show concurrent validity consistency as student age was highly correlated with total job experiences in months. One's experiences increase with age. Male was coded as 1 and female was code as 0. Total job experiences were also highly correlated with positive gender. There were more older male MI students that participated in the survey.

Table 8. Means, standard deviations and Pearson intercorrelation of the variables

	Mean	S. D.	1	2	3	4	5	6	7	8	9
1. Student Age	32.84	9.12									
2. Student Gender	0.66	0.48	0.259								
3. Project Score	70.88	8.86	0.248	0.000							
4. Job experiences in months	104.00	92.53	.858**	.298*	0.094						
5. Entrepreneurial Leadership	4.01	0.58	0.081	0.043	0.182	0.135					
6. Entrepreneurial Self Efficacy	3.92	0.46	0.266	0.218	-0.120	0.275	.429**				
7. Appreciation of Age Diversity	3.82	0.43	0.096	-0.050	-0.077	-0.002	0.129	0.209			
8. Team Climate	4.12	0.54	0.214	-0.080	0.058	0.257	.616**	.526**	.400**		
9. Innovation Work Behaviour	3.83	0.61	0.119	0.051	0.085	0.184	.486**	.405**	0.066	.628**	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

5.3.2 Correlations

Entrepreneurial leadership, entrepreneurial self-efficacy, team climate and innovation work behaviour were found to have a significant positive correlation.

Entrepreneurial leadership has no significant correlation with student age, gender and job experience in months, which confirms our understanding that entrepreneurial leadership style cannot be determined by age, gender and work experience. The correlations of all the variables are shown in Table 8. Fifty MI graduates were surveyed about their entrepreneurial leadership (M = 4.01, SD = 0.58) and entrepreneurial self-efficacy (M=3.92, SD=0.46). A Pearson's r data analysis revealed positively correlation r =0.43, p < .001. This shows that entrepreneurial leadership is positively associated with entrepreneurial self-efficacy. A MI team member with higher entrepreneurial leadership also has higher entrepreneurial self-efficacy. Entrepreneurial leadership also has one of the highest and strongest positive correlations to team climate (M = 3.12, SD = 0.54) among all variables at r=.62, p< .001, showing the importance of an entrepreneurial leader association with team climate.

Entrepreneurial self-efficacy has similar correlation as entrepreneurial leadership; it does not have any significant correlation with age, gender and experiences. This shows validity and consistency in data as entrepreneurial self-efficacy was a new skillset for all MI students. Older and more experienced MI students do not feel that they have stronger entrepreneurial self-efficacy as compared to the less experienced. This was in contrast to other business skills like engineering and sales, where older workers with more experience tend to have higher self-efficacy. Entrepreneurial self-efficacy was also highly correlated to team climate at r =.52, p < .001. This shows that a team with members having higher entrepreneurial self-efficacy tends

to have a positive team climate where all members have the confidence in performing entrepreneurial tasks.

Innovation work behaviour (M=3.83, SD = 0.61) also does not have any significant correlation with age, gender and job experience. Innovation work behaviour was highly correlated with entrepreneurial leadership $r = 0.49$, $p < .001$, entrepreneurial self-efficacy $r = 0.41$, $p < .001$, and team climate $r = .63$, $p < .001$. This confirmed our understanding of innovation work behaviour in a team, as the key antecedents of entrepreneurial leadership, team climate and entrepreneurial self-efficacy were all positively correlated to innovation work behaviour

Appreciation of Age diversity (M = 3.82, SD = 0.43) was found to have no significant correlation with other variables except the outcome variable of team climate in hypothesis 2 at $r = .40$, $p < .001$. This confirms our understanding of the appreciation of age diversity and its impact on team climate. Team members with higher appreciation of age diversity will be more appreciative of members from different age groups. This reduced conflict among team members in highly diversified innovation teams and promoted positive team climate. Appreciation of age diversity alone does not impact innovation work behaviour of a team.

Team Climate has the most correlation among all variables. Team climate was highly correlated with entrepreneurial leadership $r = .62$, $p < .001$, entrepreneurial self-efficacy $r = .53$, $p < .001$, appreciation of age diversity $r = .40$, $p < .001$, and innovation work behaviour $r = .63$, $p < .005$. This shows that it might have a mediating effect and that will be tested in the model testing shown below.

Project scores (M = 70.88, SD = 8.86) showed no significant correlation with any variables. This was an expected observation given the inconsistency of project scores as discussed earlier in the descriptive analysis. Project scores were derived

from the grades given to the project teams in their final presentations to a panel of lecturers and guest lecturer. A further study was conducted on the scores given to individual teams; it was found that team members of poor scoring teams rate that they do have a positive team climate and a strong entrepreneurial leader - but their presentation was not rated high. In the presentation scoring rubrics, project teams were rated on market opportunity, innovation, commercialisation, team member strength and presentation skill during their final presentation. Presentation skills, commercialisation and team member strength pulled down the grades of some project teams. Entrepreneurial and innovation success is rare. Most companies fail in their first prototypes, so it takes multiple attempts with each failure for the team to improve. Positive team climate and innovation work behaviour are better measurements of team potential success in the long run. An innovation team that has positive team climate and practices innovation work behaviour led by a strong entrepreneurial leader with strong entrepreneurial self-efficacy will be able to guide the team in the long journey of creating a successful innovation outcome in a dynamic environment.

5.4 Model Testing

Hypothesis 1a: Entrepreneurial leadership has a positive impact on innovation work behaviour.

Hypothesis 1b: Entrepreneurial leadership has a positive impact innovation team outcome.

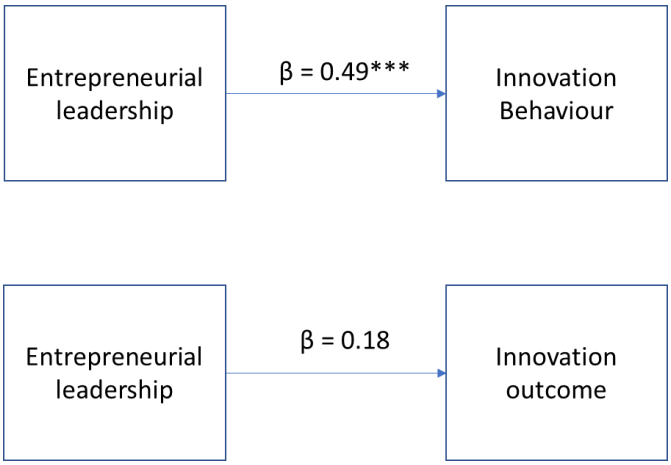
There is no significant correlation of project score with any of the variables thus Hypothesis 1b was rejected because entrepreneurial leadership was not correlated with innovation outcome. However, entrepreneurial leadership was correlated with innovation work behaviour as shown in Figure 18. A simple linear regression was calculated for entrepreneurial leadership on project score, and the results suggest that entrepreneurial leadership explained only 1.3 % of variance at adjusted $r^2 = 0.013$, $p = 0.206$. Entrepreneurial leadership, $\beta = .19$, $t = 1.28$, $p = 0.206$ does not significantly predict innovation outcome. A simple linear regression was conducted next for entrepreneurial leadership on predicting innovation work behaviour; the result suggests entrepreneurial leadership explained 22% of the variance at adjusted $r^2 = 0.22$, $p < .001$. Entrepreneurial leadership, $\beta = .49$, $t = 3.85$, $p < .001$ significantly predicts innovation work behaviour. Similar regression analysis was also performed for the other variables on innovation work behaviour as shown in Table 9. The result suggests team climate also significantly predicts innovation work behaviour at higher variance of 39% adjusted $r^2 = 0.39$, $p < .001$ and $\beta = .63$, $t = 5.59$, $p < .001$. This shows that team climate is a stronger predictor of innovation work behaviour. The results suggest that there might be possible mediation among these two variables. This will be tested (hypothesis 3 testing) below.

Table 9. Linear regression analysis of (team climate, entrepreneurial leadership, entrepreneurial self-efficacy, and appreciation of age diversity) on innovation work behaviour

	R Square	Adjusted R Square	Std. Error of the Estimate	Standardized Coefficients	T	Sig.	95% Lower Bound	95% Upper Bound
Team Climate	0.395	0.382	0.47780	0.628	5.594	0.000	0.455	0.966
Entrepreneurial Leadership	0.236	0.220	0.53672	0.486	3.852	0.000	0.242	0.770
Entrepreneurial Self Efficacy	0.164	0.147	0.56151	0.405	3.069	0.004	0.186	0.891
Appreciation of Age Diversity	0.004	-0.016	0.61278	0.066	0.458	0.649	-0.318	0.506

Dependent Variable: Innovation Work Behaviour

Figure 18. Regression model of entrepreneurial leadership on innovation work behaviour and innovation outcomes.



*Note: ***P <0.001*

Hypothesis 2a: Entrepreneurial leadership has a positive effect on a positive team climate.

Hypothesis 2b: Appreciation of age diversity has a positive effect on a positive team climate.

Hypothesis 2c: Entrepreneurial self-efficacy has a positive effect on a positive team climate.

For hypothesis 2a, 2b and 2c as shown in Table 12 and Figure 19, a four-stage hierarchical regression was performed to test the entrepreneurial leadership, appreciation of age diversity appreciation and entrepreneurial self-efficacy on team climate. In stage one (model 1), two control demographics variables were entered: student age and student gender. Total job experiences in months was excluded because of multicollinearity with student gender and student age. This was followed by the three predictor variables: appreciation of age diversity (model 2),

entrepreneurial self-efficacy (model 3) and entrepreneurial leadership (model 4), which were entered in sequences in the hierarchal regression model. The order of entry was based on the significant of individual regression analysis as shown in Table 10. Entrepreneurial leadership being the most important variable was entered last. This created four models for each variable. Results of the hierarchical analysis provide confirmation of hypothesis 2. In the first model, adjusted r^2 was at 0.06. This was expected as the control variables have no significant correlation with team climate. The adjusted r^2 increase to 0.15, $p< 0.001$ in model 2 predicting 15% of the variance. The F change value $F(1,48) =7.98$, $p<0.001$ was also significant in the second model. In the third model the adjusted r^2 increased to 0.35, $p<0.001$ when entrepreneurial self-efficacy was introduced. F change increased to $F(1,47) = 13.80$, $p<0.001$. For the final model, the variance increases to 53%, adjusted $r^2 = 0.53$, $p<0.001$. F change increase to $F(1,45) = 17.84$, $p<0.001$. In model 4, after adding entrepreneurial leadership $\beta = .46$, $p < .001$, the significant of entrepreneurial self-efficacy $\beta = .28$, $p < .05$ and age-diversity $\beta = .26$, $p < .05$ were reduced to moderate. Tests for multicollinearity indicated that a very low level of multicollinearity was present VIF = 1.06 for appreciation of age diversity, 1.39 for entrepreneurial self-efficacy, and 1.23 for entrepreneurial leadership as shown in Table 11. P-p plot shows normal distribution for model4 as shown in Figure 20. Standard residual for model 4 was below -3 and 3 as shown in scatter plot in Figure 21.

Table 10. Linear regression analysis of (entrepreneurial leadership, entrepreneurial self-efficacy, and appreciation of age diversity) on team climate

	R Square	Adjusted R Square	Std. Error of the Estimate	Standardized Coefficients	T	Sig.	95% Lower Bound	95% Upper Bound
Entrepreneurial Leader	0.380	0.367	0.42776	0.616	5.423	0.000	0.357	0.778
Entrepreneurial Self Efficacy	0.277	0.261	0.46204	0.526	4.283	0.000	0.328	0.908
Appreciation of Age Diversity	0.160	0.143	0.49779	0.400	3.026	0.004	0.169	0.838

Dependent Variable: Team Climate

Table 11. Hierarchical regression for predictors of team climate coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	3.740	0.285		13.107	0.000	3.166	4.314		
	Student Age	0.015	0.009	0.252	1.727	0.091	-0.002	0.032	0.933	1.072
	Student Gender	-0.163	0.164	-0.145	-0.996	0.325	-0.493	0.167	0.933	1.072
2	(Constant)	2.004	0.670		2.991	0.004	0.655	3.352		
	Student Age	0.012	0.008	0.208	1.519	0.136	-0.004	0.029	0.921	1.086
	Student Gender	-0.130	0.153	-0.115	-0.844	0.403	-0.439	0.179	0.927	1.078
	Appreciation of Age Diversity	0.471	0.167	0.374	2.825	0.007	0.135	0.807	0.985	1.015
3	(Constant)	0.494	0.702		0.704	0.485	-0.920	1.908		
	Student Age	0.007	0.007	0.111	0.909	0.368	-0.008	0.021	0.883	1.132
	Student Gender	-0.225	0.136	-0.200	-1.649	0.106	-0.500	0.050	0.898	1.114
	Appreciation of Age Diversity	0.351	0.149	0.279	2.356	0.023	0.051	0.651	0.943	1.061
	Entrepreneurial Self-Efficacy	0.566	0.145	0.482	3.900	0.000	0.274	0.859	0.867	1.154
4	(Constant)	-0.230	0.623		-0.370	0.713	-1.486	1.025		
	Student Age	0.007	0.006	0.124	1.189	0.241	-0.005	0.020	0.882	1.133
	Student Gender	-0.202	0.116	-0.180	-1.737	0.089	-0.437	0.032	0.896	1.116
	Appreciation of Age Diversity	0.329	0.127	0.261	2.586	0.013	0.073	0.585	0.941	1.063
	Entrepreneurial Self-Efficacy	0.329	0.136	0.280	2.422	0.020	0.055	0.603	0.719	1.391
	Entrepreneurial Leadership	0.424	0.100	0.460	4.223	0.000	0.222	0.626	0.811	1.233

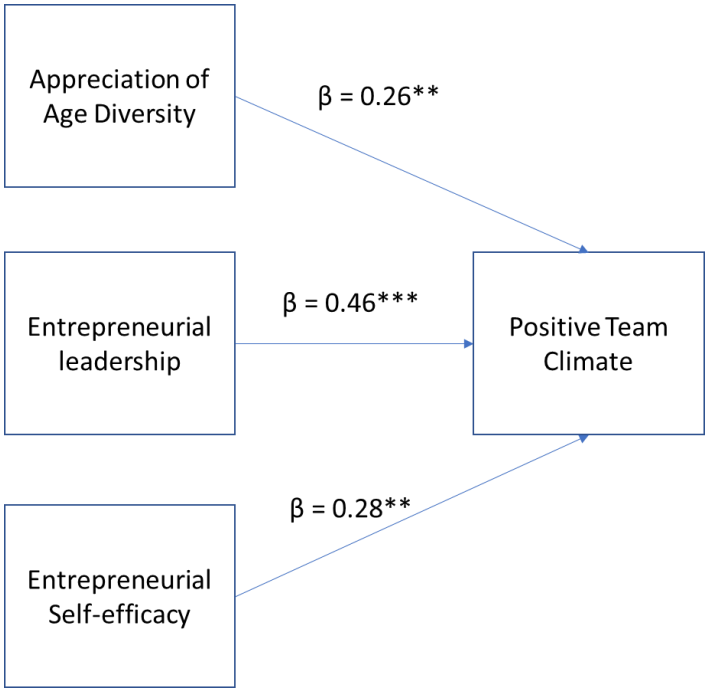
a. Dependent Variable: Team Climate

Table 12. Hierarchical regression model of the predictors of team climate (N=50)

Variables	Model 1	Model 2	Model 3	Model 4
Student Age	0.25	0.21	0.11	0.12
Student Gender	-0.145	-0.115	-0.200	-0.18
Appreciation of Age Diversity		0.37**	0.28**	026**
Entrepreneurial Self Efficacy			0.48***	0.28**
Entrepreneurial Leadership				0.46***
F	1.652	7.979**	15.208***	17.837***
R square	0.066	0.204	0.405	0.577
Adjusted R Square	0.026	0.152	0.352	0.528
R square change	0.066	0.138	0.201	0.172

*p <0.05
**P < 0.010
***p < 0.001
N= 50

Figure 19. Hierarchal regression model for positive team climate



*Note: ***P <0.001*

Figure 20. Normal distribution P-p Plot for team climate with its predictors of entrepreneurial leadership, entrepreneurial self-efficacy and appreciation of age diversity

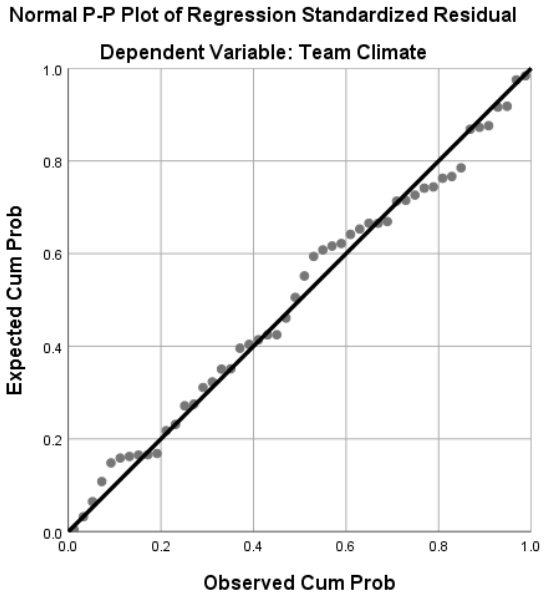
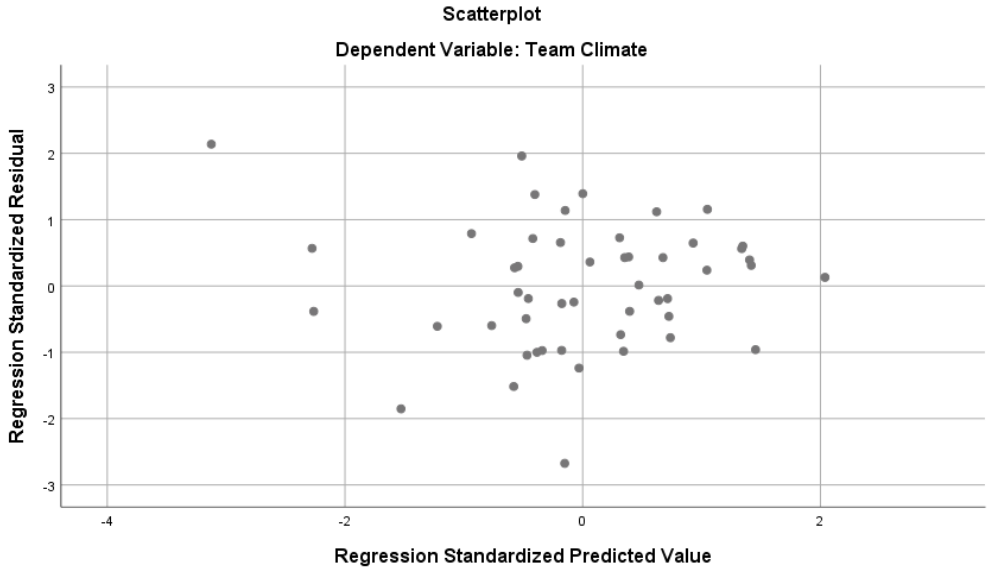


Figure 21. Residual plot for predictors of team climate

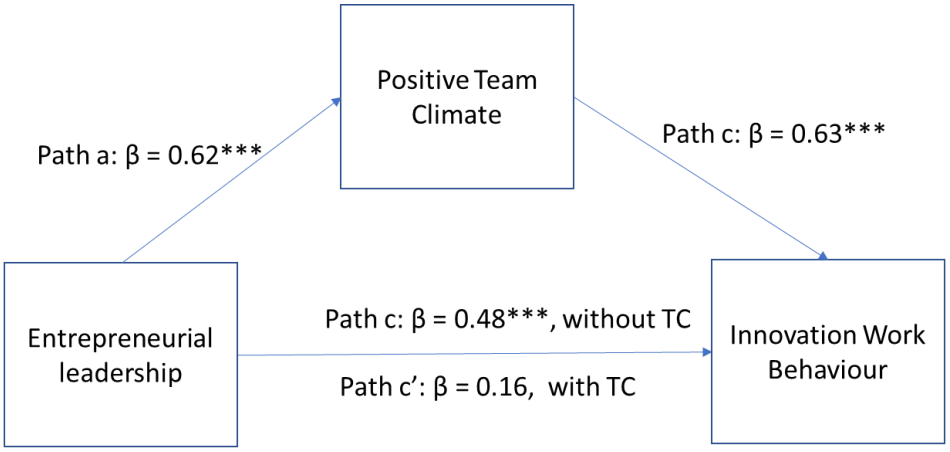


Hypothesis 3: Positive team climate has a mediating effect on entrepreneurial leadership impact on innovation work behavior.

For Hypothesis 3, mediation effect of team climate on innovation work behaviour was tested as shown in Figure 22. The hierarchal regression was run first to check for mediation as shown in Table 13. Stage 1 (model 1) entrepreneur leadership was entered followed by team climate (model 2) into hierarchical regression model. In model 1 entrepreneurial leadership significantly predicts innovation work behaviour $\beta = 0.47$, $P < 0.001$ at 22% of the variance and adjusted $r^2 = .22$, $F(1,48) = 14.84$, $P < .001$. In model 2, when team climate was entered into the model, entrepreneurial leadership effect on innovation work behaviour became insignificant $\beta = 0.16$, $P > 0.1$ and team climate effect was significant $\beta = 0.53$, $P = .001$. The variance also increases $r^2 = .39$, $F(2,47) = 14.84$, $P = 0.001$. The reduction of coefficient and reduced in significant is a sign of mediation.

The Baron & Kenny approach was used to test the mediation effect (Hayes, 2009) as shown in Figure 22. Step 1, entrepreneurial leadership regression on the mediator team climate was significant as proven in hypothesis 2a testing, $\beta = 0.62$, $P < .001$. Step 2, the mediator team climate regression on innovation work behaviour was also significant, $\beta = 0.63$, $P < .001$. Step 3, Entrepreneurial Leadership effects on innovation work behaviour without the mediator was significant, $\beta = 0.49$, $P < .001$. Step 4, adding team climate into the regression of entrepreneurial leadership on innovation outcomes reduces the effect of entrepreneurial leadership on team climate and it changes the coefficient to not significant $\beta = 0.15$, $P = 0.146$. This shows that team climate fully meditates the effect of entrepreneurial leadership on innovation work behaviour. To verify the mediation, Sobel test (Sobel, 1982) $z = 3.89$, $P < 0.001$, was conducted and the result shows significant mediation. The Preacher and Hayes bootstrapping method was also used to test the mediation (Preacher & Hayes, 2004). The bootstrap test examined 95% confidence interval of the indirect effect of 5000 bootstrap resample, $B = 0.34$, CI = 0.11 to 0.70. Confidence interval did not fall in between zero. The results suggest mediation of team climate on entrepreneurial leadership impact on innovation work behaviour. Entrepreneurial leadership with the mediator of positive team climate was a better model of predicting innovation work behaviour.

Figure 22. Mediation model of team climate on innovation work behaviour



Note: ***P <0.001

Table 13. Regression model of team climate mediating entrepreneurial leadership impact on innovation work Behaviour (N=50)

Variables	Model 1	Model 2
Entrepreneurial Leadership	0.49***	0.16
Team Climate		0.53**
F	14.841***	13.890**
R square	0.236	0.410
Adjusted R Square	0.220	0.385
R square change	0.236	0.174

*p <0.1
**P < 0.05
***p < 0.001
N = 50

5.5 Summary

Descriptive statistics were discussed in this on the MI teams survey participants. A total of 50 survey results was collected. The average age of the survey participants was 33 years old with 9 years of work experience. 66% of the respondents were males and 34% were females. Cronbach alpha were below 0.7 for all measurement instruments showing internal consistency reliability of the measurement scale used. The correlation analysis was performed to examine the association between the control variables (age, gender and job experiences in months) and other variables in the model (project score, entrepreneurial leadership, team climate, appreciation of age diversity and innovation work behaviour). Project score does not correlate with any variables and team climate has the most correlation with other variables. No multicollinearity was found for team climate and other variables as VIF value was below 1.5. Based on the results of the regression analysis, the study suggests that Hypothesis 1a is true as entrepreneurial leadership was positively associated with innovation work behaviour but hypothesis 1b is not significantly associated with innovation outcomes, i.e. the project score. The study also suggests that Hypothesis 2a, 2b and 2c were true in the hierarchical regression analyses as all three variables, entrepreneurial leadership, entrepreneurial self-efficacy and appreciation of age diversity, positively and significantly effects team climate. In the mediation test, Sobel and Preacher Hayes bootstrap method was used, and the bootstrap results suggest that team climate mediates the effect of entrepreneurial leadership on innovation outcomes, thus proving that Hypothesis 3 is correct. The hypothesis model testing will be further discussed in Chapter 6.

Chapter 6 - Discussion

6.1 Introduction

This chapter will discuss the quantitative research analysis results for the three hypotheses. This research explored the impact of entrepreneurial leadership on team climate and innovation work behavior in MI project teams. As entrepreneurial leadership is a nascent theory, there are limited empirical studies on the topic. Therefore, this study fills a gap and the results shed more light on the important role of entrepreneurial leadership as driver of successful innovation teams.

6.2 Quantitative research results

Hypothesis 1a: Entrepreneurial leadership was positively and significantly associated with innovation work behavior. This is consistent with the literature, as scholars have been using innovation work behavior as a dependent variable in measuring innovation (Afsar et al., 2014; Khan et al., 2012; Pieterse et al., 2010). Results suggest that a 'strong' entrepreneurial leader is able to influence members to work in a more innovative way.

Hypothesis 1b: Project score/innovation outcome was not significantly associated with any variables in the study. This could be due to several reasons. The project score rubrics emphasized other elements not tested in the model. The rubrics on presentation skills and team member strength did not have any association with the variables that were tested. These two variables were associated with the team members' personal skillset in team dynamics. Although we can argue that strong leadership plays an important role in leading the team, if team members lack personal skillsets, the team will still fail. This result contradicts previous

exploratory case study research on entrepreneurial leadership predicting successful innovation outcomes (Menkhoff, 2015). By increasing the sample size and generalizing the theory, it was observed that team dynamics plays an important role in the success of the team. Furthermore, entrepreneurial and innovation success is rare. The true success of innovation outcomes needs to be measured by a longitudinal study of team results in producing different innovation outcomes. At a minimum, this study suggests that teams with strong entrepreneurial leadership help fostering innovation work behavior in teams. In the long run, this might result in creating innovation outcomes. In the case of the MI team, they were graduate students performing the innovation task for the first time during their entrepreneurial training in the university. The success rate of their first innovation outcome could be affected by other factors besides team dynamics such as members' passion and members' commitment in terms of time spent on the project. The success of the MI program should not be focused on tangible innovation outcomes alone. It should be focused on the education acquired from the course that helps 'students' to foster innovation work behavior in the long run.

Hypothesis 2a, 2b and 2c: Empirical results suggest that entrepreneurial leadership, entrepreneurial self-efficacy and appreciation of age diversity were positively and significantly associated with positive team climate. Entrepreneurial leadership's significant positive impact on team climate is consistent with the literature with team climate being a moderator and mediator of leadership theories (Eisenbeiss et al., 2008; Sarros, Cooper, & Santora, 2008; Wang, Oh, Courtright, & Colbert, 2011; Xue, Bradley, & Liang, 2011; Zohar & Tenne-Gazit, 2008). Results also suggest that team members' confidence in their entrepreneurial skill set in entrepreneurial

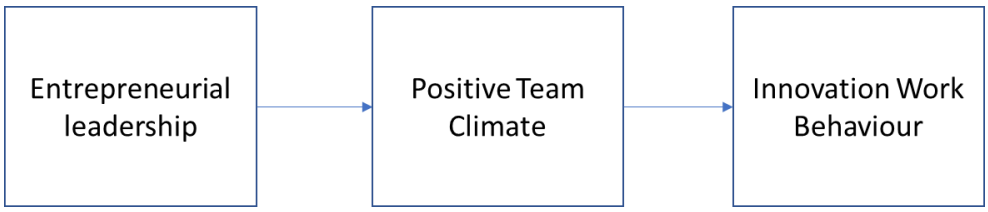
self-efficacy positively effects the team climate. Most innovation teams worked in small groups with limited resources, so each member needed to be well equipped with skillsets related to entrepreneurial activities. In the literature age diversity in groups negatively affects team climate (Bassett-Jones, 2005; Harrison & Klein, 2007; Hentschel et al., 2013) and this study suggests having an appreciation of age diversity (Wegge et al., 2011) positively impacts team climate.

In our exploratory research findings, some teams did not have a positive team climate as some members got into fights during discussions. This study sheds some light on the possible causes of conflict such as members' low entrepreneurial self-efficacy and under-appreciation of age diversity. Results suggest that the in fighting can be reduced if members are well trained in entrepreneurial activities and have an appreciation of age diversity in diverse innovation team contexts. Results of the hierarchical regression suggest that entrepreneurial leadership is the most important variable that positively impacts team climate. A strong entrepreneurial leader is also a teacher to the team members and guides the team members to improve entrepreneurial self-efficacy.

Hypothesis 3: In our mediation model testing, it was found that team climate positively mediates the relationship between entrepreneurial leadership and innovation workplace. This was consistent with the literature on team climate as a mediator or moderator of innovation in transformational leadership (Eisenbeiss et al., 2008). Having a positive team climate helps to mediate the effect of a strong entrepreneurial leader to foster team innovation work behavior. Appreciation of age diversity was not significantly associated with innovation work behavior, as not all teams were age diverse. It was observed that award-winning teams were strong in expertise and social diversity (Menkhoff, 2015), while the importance of

appreciation of age diversity in non-diverse groups was low. We can argue that having appreciation in age diversity doesn't mean you start performing innovation work behavior as it only impacts team climate, not innovation work behavior. Further tests will have to be conducted on this argument with a larger sample size of all age diverse teams. Although entrepreneurial self-efficacy was positively associated with innovation work behavior at $P < 0.05$, adding entrepreneurial self-efficacy in the multiple regression with entrepreneurial leadership reduces the significance of both variables on innovation work behavior. Entrepreneurial self-efficacy should be removed from the mediation model on innovation work behavior. The final conceptual model is shown in Figure 23.

Figure 23. Model for entrepreneurial leadership predicting innovation work behavior



6.3 Summary

In this chapter the empirical test results on the three-hypotheses analysis were discussed. Hypothesis 1b was not correct as entrepreneurial leadership was not able to predict the project score but Hypothesis 1a was correct as entrepreneurial leadership was able to predict the innovation work behavior. This could be due to various reasons discussed in Chapter 6. Hypothesis 2a, 2b, 2c and 3 were all true based on the empirical testing results. The result suggests that entrepreneurial

leadership, entrepreneur self-efficacy and appreciation of age diversity predicts team climate for an innovation team. Team climate is also a mediator for entrepreneurial leadership impact on innovation work behavior. The next chapter reviews the research study and answers the research questions. The limitations of the study, theoretical implications, managerial implications, professional contribution and recommendation will also be discussed.

Chapter 7 - Conclusion

7.1 Introduction

The aim of this research was to explore the antecedents of entrepreneurial leadership and team climate impact on innovation teams. Entrepreneurial leadership is a new and emerging theory, and there are limited empirical studies on the topic. This research contributes to the existing literature on entrepreneurial leadership. The findings are broadly in line with recent research on entrepreneurial leadership having a positive impact on innovation teams (Leitch & Volery, 2017). Furthermore, the objective of this study was to understand how to create successful innovation teams in a start-up environment. The MI students' capstone project works present a good scenario to study this phenomenon. This chapter entails the qualitative and quantitative research conclusions, answers the research questions and discusses the limitations of the research as well as the theoretical and managerial implications. The professional contribution and recommendation for a managerial framework for entrepreneurial success in innovation team are introduced in the last section of this chapter.

7.2 Qualitative research

The qualitative interview findings of this research presented in Chapter 4 suggest that entrepreneurial leadership is vitally important for the success of innovation teams. Most successful start-up teams are started by diverse teams and led by a strong entrepreneurial leader. In our studies of the MI project teams, all of the award-winning teams turned out to be made up of diverse members. Expert diversity helps in the ideation process as members were able to share different ideas

from diverse experiences. A strong entrepreneurial leader was able to pick the best idea and guide the team in proceeding to the next phase of product development. The feedback from several interviewees was that it was common that during the ideation phase, teams got into heated conversations and arguments, which caused a negative team climate. Award-winning teams were able to avoid this with the help of a strong entrepreneurial leader, while average teams suffered from poor team climate which resulted in team break up or members dropping out from the course. This led us into further studies on what impact a positive team climate has on innovation teams in our empirical studies. Entrepreneurial self-efficacy and appreciation of age diversity were observed in the interview transcripts as predictors of positive team climate. The qualitative research results suggest that in award-winning teams and average teams, appreciation of age diversity and strong entrepreneurial self-efficacy among members creates harmony in the diverse group, promoting positive team climate. Success in entrepreneurship commercialization is rare; some teams could design brilliant ideas and prototypes, but when they were launched into the market, the products failed. For those who succeeded, it was through multiple iterations of prototypes and market testing before they could find the winner. Innovation was the common theme found in successful start-ups with commercialization success. All companies operate in a dynamic environment with ever changing technology, competition from competitors and changing customer buying behavior. Without constant innovation, firms will fail to create and capture value. This explains the importance of examining the drivers of innovation work behavior and outcomes. The qualitative research suggests that award-winning teams were able to create innovation outcomes with strong innovation work behavior led by strong entrepreneurial leaders who created a positive team climate

with strong team members' entrepreneurial self-efficacy and the appreciation of age diversity. Key antecedents were discovered in the qualitative research for creating successful innovation teams: *entrepreneurial leadership*, *entrepreneurial self-efficacy*, *positive team climate* and *appreciation of age diversity*.

7.3 Quantitative research

In the quantitative research, we sought to empirically test the antecedents by surveying MI students. Results of the empirical tests were able to predict MI teams' positive innovation work behavior with significant effects from team climate, entrepreneurial leadership and entrepreneurial self-efficacy. But the results on innovation outcome were not significant; this is due to some limitations of the MI teams that will be discussed below. A model was introduced to predict innovation work behavior. The finding shows that the model significantly predicts innovation work behavior with entrepreneurial leadership and positive team climate.

Team climate was also found to be mediating entrepreneurial leadership effects on innovation work behavior. This supports prior research on transformational leadership moderating the effect of support for innovation in innovation teams (Eisenbeiss et al., 2008). The finding suggests that entrepreneurial leadership style is a better predictor of positive team climate in innovation teams as compared to transformational leadership style. Entrepreneurial leadership was positively and significantly associated with all the subconstructs of team climate: team vision, participative safety, task orientation and support for innovation. This research suggests that a leader who is strong in entrepreneurial leadership style is able to motivate the team with strong vision and task orientation in completing each innovation process stage, creating a safe environment that supports innovation.

These are important characteristics in a start-up process team. Participative safety encouraged team discussion and reduced conflicts. Although innovation is important in a start-up environment, team members need to perform multiple roles and work on tight deadlines. Task orientation focus allows the leader to lead the team in a single task without distraction. This is especially important for innovation teams, as most teams tend to fall into the trap of constant ideation and the lack of focus to proceed to the next phase of commercialization.

7.4 Answering the research question.

With regard to the research question (RQ1) on the role of entrepreneurial leadership in creating innovative new business ventures as outcomes of students' capstone projects, the research findings suggest that entrepreneurial leadership does indeed matter; during the qualitative interviews all award-winning team leaders exhibited strong entrepreneurial leadership in leading the team in innovation. The quantitative results were not conclusive as the data have limitations in predicting innovation outcomes. Nevertheless, the quantitative results were able to predict innovation work behavior from 'good' entrepreneurial leaders that will lead to innovation outcomes in the future.

For RQ2 with its emphasis on the impact of 'strong' entrepreneurial leadership on the team climate in a diverse innovation team context, the results are affirmative. Both the qualitative and quantitative results show that entrepreneurial leadership positively and significantly effects positive team climate. This shows the importance of having a strong entrepreneurial leader in an innovation team who can cultivate a positive team climate in a diverse team context.

7.5 Limitation of the research

Unfortunately, the nature of MI student teams does not allow us to determine whether entrepreneurial leadership has a direct effect on project scores. This was due to several limitations of the data, including the limitation of the grading system. The available grading system focused on final presentation scores by a panel of judges. This score does not contribute to the final grade of the capstone project. The capstone project proposals submitted by the teams were only awarded a pass or fail grade. Program directors and university administration judged the success of the innovation outcome in whether the MI project teams won awards in start-up proposal competition. During the interviews with MI students, interviewees reflected on the high commitment required to participate in start-up competitions. 90% of the MI graduates were working in a full-time position while taking the MI course. Some of these competitions were organized in other countries, making participation difficult. Most of the MI students did not have time to participate. Only limited teams participated in these external competitions.

As for the individual unit of analysis in the quantitative research survey, MI graduates reported their individual reflections about their team leader's entrepreneurial leadership and their shared perceptions of the team climate. Each MI graduate (from the same team) shared the same leader and the same team climate. There was a total of 13 team leaders in the sample, so one could argue that each MI graduate would react and feel differently in the same team environment. Some may feel that their leader had strong entrepreneurial leadership and they had a positive team climate, but some may not feel that way. This lack of independence of the individual unit of analysis could lead to an overestimate of the significance level of the findings.

Another challenge for conducting quantitative research on MI students was the sample size; the response rates for graduates who left the program more than 3 years earlier was low. This was due to the diverse class profile; in some cohorts more than 50% were international students ("Master of innovation Profile," 2018). These graduates might have relocated out of the country as they did not respond to the online survey. The response rate of 46% was considered high for a survey. A full qualitative research study will be more appropriate if the program director wants to find out how to create more award winners. Unfortunately, the sample size for award winning teams was also very low. There were only 3 teams in the last 5 years. Award winners are rare and innovation success is also uncommon. The limitation of the results was that it was based on teams completing one project; future research on innovation teams based on a longitudinal study design will help to better understand innovation outcomes as success is accomplished through multiple trials and failures. Nevertheless, these results help in understanding the impact of entrepreneurial leadership on team climate and innovation work behavior.

The challenge of finding a single or multiple predictors of successful start-ups was difficult. There were many internal factors that might affect innovation outcome results such as team dynamics, members' passion and commitment in terms of time spent on the project or members' domain experiences. Holding all these variables constant affects the prediction of innovation outcome. Although success is rare, teams that practice innovation work behavior will have a better chance in producing innovation outcomes in the future.

7.6 Theoretical implications of the research

This research is believed to have made important theoretical and empirical contributions to the field of entrepreneurial leadership. The mixed method research results add to the growing knowledge of team climate, appreciation of age diversity and entrepreneurial self-efficacy as variables in the context of innovative start-ups. The empirical results suggest that entrepreneurial leadership was significantly associated with all the subconstructs of team climate. This is an important finding in our understanding of leaders who operate in start-up environments. Entrepreneurial leadership style better reflects leaders in an entrepreneurial and innovation role as compared to transformational leadership. Entrepreneurial leaders are leaders leading small innovation teams with limited resources that need to innovate to succeed. These leaders must put on multiple hats in executing and leading the team. Transformational leadership style is more appropriate for large multinational companies, and entrepreneurial leadership style is more appropriate for start-ups. As start-ups transition into the next phase of transforming into bigger entities and eventually multinational companies, leadership styles will need to change. This could explain why start-up founders often fail to manage the company during scaling and prefer to cash out and let professional mangers run the company. The founder's entrepreneurial leadership style might not be appropriate for scaling-up and/or an established company. For an innovative start-up to continue to be successful, the founders might need to switch their entrepreneurial leadership style to transformational leadership. One of the key differences in entrepreneurial leadership and transformational leadership is the individual consideration for transformational leadership. Transformational leaders show empathy and concern for followers, for example in an established multinational company, but in an

entrepreneurial environment, the leader operates with tight resources and will have to cut loose any non-performer in order to survive. The focus will be on task orientation in creating a successful product. Both leadership styles promote innovation in teams. But this research suggests that entrepreneurial leadership is more suitable for start-up teams.

This research is part of an ongoing research project on age-diverse innovation teams aimed at establishing what it takes to harness the innovation potential of age-diverse work teams comprising members of different generations (Menkhoff, 2015). Part of this research was presented at the IAFOR Global Innovation Value Summit 2018 in Tokyo (Neo, Menkhoff, & Chay, 2018).

7.7 Managerial implications

This research offers suggestive evidence of the type of leadership to lead innovation teams. The importance of team climate in an innovation team is often ignored by managers. In a business environment, companies understand the importance of innovation. There was a common trend during the dot-com days for established companies to set up innovation departments to drive innovation internally to compete with start-ups (Wessel, 2012). The innovation teams in these newly formed departments were typically formed by employees taken out from different departments in sales, engineering, procurement and R&D. This was done in the belief that expert diversity promotes innovation and that employees with different skillsets are able to innovate interesting products. The end results of these innovation teams were mostly poor, and the companies ended up closing these innovation departments. One of the reasons for their failure was that the wrong leader was assigned to lead the team. The findings of this research suggest that the

leader of an innovation team needs to be able to create a positive team climate with a strong entrepreneurial leadership approach that fosters innovation work behavior. Team climate is often dictated by the leader. Management should pick a leader strong in entrepreneurial leadership to lead an innovation team. Socially diverse teams are known to cause conflict among members. Companies should conduct workshops for team members to understand the basic values binding different generation groups together to improve appreciation of age diversity.

Entrepreneurs are the de facto leaders in innovation teams; they can be trained in entrepreneurial leadership style and become more aware of the need to create a positive team climate in their teams to promote innovation work behavior. If their teams are age diverse, appreciation of age diversity through team training could enhance a positive team climate.

7.9 Professional contribution and recommendations - Managerial framework for entrepreneurial leadership success in innovation teams

The entrepreneurial leadership framework for innovation teams shown below in Figures 24, 25 and 26 is a step-by-step approach for helping innovation teams. The framework focuses on the different stages of an innovation process performed by an innovation team, from the beginning of team formation up to the successful commercialization of the product or services. This framework was created based on the research findings and the study's theoretical model.

Stage 1 (Figure 24). Team formation is an important step that may determine the success and failure of a team. Based on the qualitative research and review of past award-winning MI teams, all these teams have something in common. They are diverse in terms of expertise and also socially. Expert and social diversity teams

tend to do better with members having a different skillsets and experiences. The focus of finding the right fit with members of different skillsets and team chemistry in a positive team climate was key to success for the award-winning teams. Below is a quote from a member of an award-winning team:

Figure 24. Entrepreneurial leadership framework for innovation teams

Innovation stages	Key activities	Gap/Support	Theory
1. Team formation	1. Form teams with different expertise & age diverse members 2. Selection of leader a. Entrepreneur leadership assessment kit b. Entrepreneurial skill set assessment kit. c. Appreciation of age diversity assessment kit	1. Training on entrepreneur leadership course 2. Training on entrepreneur skill set course 3. Appreciation of age diversity related course.	1. Entrepreneurial Leadership 2. Entrepreneurial Self-efficacy 3. Appreciation of age diversity

Figure 25. Entrepreneurial leadership framework for innovation Teams

Innovation stages	Key activities	Gap/Support	Theory
2. Ideation & Screening	1. Opportunity recognition based on possible commercialization and scaling of the product or services. Lead with passion, vision and encourage risk taking. 2. Stay focus and work within a timeline (task orientation). 3. Perform market study and testing of the idea. If market does not respond drop the idea and move on to the next one. Don't fall in love with your idea. 4. Be aware of team climate and appreciation of age diversity issues.	1. Entrepreneur course on opportunity recognition, vision, and passion. Market segment and marketing training to understand the customer. 2. Find domain expert as advisor of the team. 3. Expert & mentor feedback on opportunity recognition (expert and mentor have done it, they are able to recognize the opportunity) 4. Team building activities to build strong team identification	1. Entrepreneurial Leadership 2. Entrepreneurial Self-efficacy 3. Team Climate 4. Appreciation of age diversity 5. Innovation work behaviour

Figure 26. Entrepreneurial leadership framework for innovation Teams

Innovation stages	Key activities	Gap/Support	Theory
3. Concept development & Product development (business plan)	1. Lead with vision, passion, risk taking and motivate team in product development and focus on innovation. 2. Focus on creating a business model or rapid prototyping to test the market (task orientation).	1. Innovation product development course. 2.Business modelling course. 3. Rapid prototyping.	1. Entrepreneurial Leadership 2. Team Climate 3. Innovation work behaviour
4. Commercialisation. (getting seed funding or internal approval for project)	1. Lead with vision, passion, risk taking and innovation. 2. Launch prototype. Rework and improve business plan 2. Participation of start-up and innovation competition to get exposure and test the business plan	1. Exposure to venture capitalist network. 2. Training on pitching to VCs.	

> *"For us the process (team formation) was interesting. Unlike other teams. I will start off with how other teams did it. For my batch we have created an excel sheet online the whole class can have access to it. Everyone will chip in their ideas. Example I want to do idea A or B. People can look at this idea and decide to join one team. They went through the approach in finding the idea using the idea to lure people to join their team so that's how they form team but for us we actually look at team chemistry. We did not start with any idea. We respect each other point of view. We started when me and the oldest member of the group. I asked him shall we partner together in this project. He analyzed what are the skillset that we don't have, and we go around talking to those guys with the missing skillsets. Communicate with them to see whether they will be interest to join us. We convince people without an idea. There wasn't much barrier to it as we are convincing people through a purpose. Rather than I have this great idea that I will get one million investments."*

The quote from the award-winning team member shows that entrepreneurial leadership plays an important role, especially when the members in the team already have a strong purpose. A strong, passionate entrepreneurial leader who shares and manages to further ignite purpose will be able to lead the team with a clear vision. After the team is formed, the next step in the team formation process is to appoint a leader. Team members may utilize the entrepreneurial leadership, entrepreneurial self-efficacy and appreciation of age diversity assessment kits as shown in Appendices 4, 5, and 6 to find out about their competency gaps related to these

three pillars of a good entrepreneurial leader. For academic courses with innovative capstone projects, these three topics should be taught at the beginning of the course so that learners acquire entrepreneurial leadership, entrepreneurial self-efficacy and team dynamics skills. Members of internal innovation teams can use the assessment toolkit to evaluate who is more suitable to lead the team. To identify strategic competency gaps, the HR department could review the findings after the tests have been conducted to identify relevant course topics to support the innovation agenda. The process is similar for start-up teams: start-up team members should use the assessment toolkit to find out about their gaps. Once the gaps are identified, they may sign up for courses related to their weaknesses. Alternatively, they could get support from a network of mentors to guide them in overcoming some of these challenges as shown in Figure 24.

Stage 2 (Figure 25) Ideation and screening: Entrepreneurial leaders should challenge the team members to think innovatively during the ideation stage to come up with an innovative idea. Here is a reflection from a member of the award-winning team, discussing whether his leader is creative and how they came up with new ideas.

> *"My team leader does come up with ideas but not often. He does but after collective wisdom. Example: We will throw him a lot of ideas and he said he will go back and think about it. We will come up with some ideas that is wild but to him it is workable. He is not the only one with the ideas. We will ask very tough questions to challenge his view, He will go back and think about it and take our ideas to work on something innovative."*

Entrepreneurial leaders need to be creative, but they also need to empower the team to ideate. The key role is to recognize the opportunity and to commercialize it. It is common that with positive team climate and strong entrepreneurial self-efficacy, the team will be able to come up with lots of ideas. It's the entrepreneurial leader's role to help pick the most suitable idea. The idea picked should be based on the commercialization and scaling potential of the product or service based on market and customer knowledge. An entrepreneurial leader needs to be task-oriented and must focus on picking the right idea before proceeding to the next stage. A common trap for some MI teams was "falling in love with an idea". Despite feedback from professors and external mentors some teams refused to change their idea. Here is a reflection from the award-winning team leader:

> *"The way I look at it, students need to be realistic, think whether it is workable in the real world. Some of my classmate project are not workable and practical at all. Otherwise when you talk to investor you will have problem. The MI program, when you go through the different stage's professor will challenge you. Whether it is practical, but some students are so stubborn that they want to stick to their poor idea."*

The key to success is focus and task orientation, using models to test opportunity recognition and getting advice and feedback from domain experts who have market and customer knowledge, and validating the idea with external entrepreneur experts as well as venture capitalists. In order for the product to be successful, it needs to meet market and customer demand, as an innovation idea put forward by teams also needs to secure funding and contacts to venture capital. As an entrepreneurial leader,

he or she needs to lead the team forward to the next stage. Another reflection from the award-winning team leader:

> *"I tell you why we have won so many competitions. For me I am very focus on what I am doing. The other teams in class are not focus on what you suppose to do."*

Lastly, team leaders need to be aware of team climate and possible age diversity issues. Teams with gaps in this respect need to surround themselves with domain and entrepreneurial experts who can advise them on opportunity recognition. They need to present their idea to them and take criticism and feedback positively to improve on their idea. To improve team climate, team leaders should organise team-bonding events to improve team identification and beware of age diversity issues. This stage is similar for internal teams, start-up entrepreneur teams and MI teams.

Stage 3 (Figure 26): Concept development, product development and finalized business plan. Innovation success is rare and those who succeed go through multiple trials and errors. Entrepreneurial leaders need to lead the team in testing and improving the product. Techniques in business modelling and rapid prototyping can be used during this stage. The role of the leader is to lead the team through this trial and error stage by challenging the team to innovate and maintaining a positive team climate. Gaps during this stage could be addressed by different courses with focus on team-based innovation development matters. MI teams, start-ups and internal teams can address issues by hiring or adding new members to join the team with the required skillsets such as product development and testing know how. Some companies have a different team that assist the innovation team in testing prototypes.

Team climate is again a very important matter if new members are added. The entrepreneurial leader will have to lead both teams in completing this stage.

Stage 4 (Figure 27): Commercialization. This is the last stage where teams secure the necessary funding to launch the product or services. The role of the entrepreneurial leader is that of a sales leader to the venture capitalist or internal fund manager. For the academic program, a venture capitalist can be invited for networking with the MI teams. Training should be given to the MI teams on how to successfully pitch to venture capitalists. Start-ups will have to understand the local venture capitalist network in order to find the most suitable partner to pitch their idea. The entrepreneurial external advisor or mentor will be a good network contact for them to start with and these advisors will also be able to advise them on how to secure seed funding in their sales pitch to the venture capitalist. HR departments could organize a special training course on sales pitching for internal innovation teams.

7.8 Summary

In this chapter, the conclusion of research was discussed. This research makes a significant contribution to the literature of entrepreneurial leadership on innovation work behavior. The result of the empirical tests suggests that team climate has a mediating effect of entrepreneurial leadership on innovation work behavior. Having a positive team climate enhances the effect of innovation work behavior of the team. With regard to managerial implications, a managerial framework for entrepreneurial success in innovation teams was introduced in this chapter. It is a professional framework designed for practitioners based on a step-by-step approach to examine a team's entrepreneurial leadership strength and to identify related gaps.

This framework can be used for academics, entrepreneurial start-up teams and internal innovation teams. In the next chapter recommendations for further research will be discussed.

Chapter 8 - Recommendations

8.1 Introduction

There are several avenues for further research on entrepreneurial leadership impact on innovation teams. In this chapter, some of these areas are discussed: expanding the research to surveying start-ups, a longitudinal study of internal teams in a multinational company, introducing other constructs like entrepreneur passion and domain experience that may impact entrepreneurial leadership, the types of entrepreneurial leadership required at different stages of the start-up company, entrepreneurial education – all these topics can be investigated and are possible research areas to expand scholars' understanding of entrepreneurial leadership and innovation teams.

8.2 Surveying start-ups

The same research may be conducted on start-ups, and these will increase the sample sizes of innovation teams. The challenge will be gathering data from different startups. By increasing the sample size, the researcher may be able to find significant impact on innovation outcomes by measuring the success of products launched by these start-ups. Team commitment will be better measured as all members are committed full-time to the project. Start-up success and innovation outcomes can be measured by the amount of revenue generated from the product or service.

8.3 Surveying internal innovation teams and longitudinal study

Changing the context to study internal innovation teams in multinational companies (Eisenbeiss et al., 2008) allows the research to be extended into a longitudinal study. This will give insights into the impact of innovation outcomes from different periods of time. A longitudinal study will allow the researcher to evaluate the impact of entrepreneurial leadership on innovation work behavior in different periods. Experiments on different treatment groups may also be conducted to understand the impact of entrepreneurial leadership. Teams with team leaders who attended entrepreneurial leadership courses could be compared with teams with leaders who did not attend such courses.

8.4 Employees' passion and team commitment

Entrepreneurial passion has been an emerging area of study on successful entrepreneurs and entrepreneurship (Cardon, Gregoire, Stevens, & Patel, 2013; Melissa S Cardon et al., 2009; Mueller, Wolfe, & Syed, 2017). Entrepreneurial leadership association with sustaining employee's passion and positive team climate can be an area to further explore. Entrepreneur team members with strong passion should have stronger commitment than those with low passion. Employee passion could moderate or mediate the effect on team climate.

8.5 Entrepreneur's prior domain and job experience

For MI team success, members' prior industry experiences on the capstone project domain, was an area identified during our qualitative interviews with award winning teams. The award-winning teams have members or leaders with more than

5 years working experience in the capstone project domain. Average teams that had 'mediocre' projects often lacked domain knowledge in the product. The common comment from panel judges on these types of projects was *'good interesting ideas, but I doubt it will work in the market, you need to understand the market before you proceed with the idea'.* For the award-winning teams, the capstone project was not their first project in the domain. Team members have been working in the domain and have good knowledge of the market. In our studies we examined the total months of job experience; further research may narrow this into total months of job experiences in the innovation/capstone project domain.

8.6 Entrepreneurial leadership impact on different stages of the innovation process

For the transition of an innovation team from start-up to an established innovative company, further research on appropriate leadership required to run successful teams at different stages of the company's growth will give insights into why a founder's leadership style might not be suitable for established companies. This has been evidenced as founders are often replaced when the start-up company changes from a small startup into a large-scale company. Fund managers will often replace the founder with professional managers. Different stages of the innovation process from the planning phase to the execution phase require different skillsets. Measuring the impact of entrepreneurial leadership on different phases will be a good area to explore.

8.7 Improving the managerial entrepreneurial survey toolkit

A managerial entrepreneurial leadership survey toolkit was introduced in Chapter 7. It is an assessment toolkit that can be used by team members to examine their entrepreneurial leadership style, entrepreneurial self-efficacy and appreciation of age diversity. The survey results can be used to identify the weaknesses in the members leadership styles. The HR department can use this as gap analysis to implement training measures for the innovation team. Entrepreneurial passion assessment can be added to further expand the gap analysis toolkit. Other assessments relating to team dynamics can also be added to measure the team members' working style, whether they are planners, communicators, doers or policy people. This will help in team formation, as entrepreneurship needs doers to execute. It would be unwise to have a team comprising only planners.

This framework can be used as a foundation for creating a series of short online training courses as shown in Appendix 6. This course can be attended by executives in a workshop format or a module in an undergraduate or master level education. An online or app version of the survey toolkit can also be created. Information of participant assessment scores and profiles can be stored in a cloud. The profile of the team members can be shared in a professional social network for matchmaking of future innovation teams. This profile can also be used by the HR department in their hiring process of innovation members. Research on entrepreneurial leadership impact can also be conducted based on the data collected with the help of the online assessment toolkit.

8.8 Entrepreneurial leadership education and MI program recommendations

The success of unicorns and IT entrepreneur billionaires has prompted significant interest from public on entrepreneurship. Higher institutions of learning have been offering new entrepreneurial related courses and degrees to meet this interest and demand (Kuratko, 2005; Martin & Karen, 2015). An area for further research could be to examine how different types of entrepreneurial courses impact graduates over time based on a longitudinal study. A case study review on graduates' learning and success will help scholars understand how entrepreneurs can be trained and if the training has been effective. Matlay (2008) examined university entrepreneurial education courses offered in the USA and found that 78 out of the top 100 universities in the US regarded the development of a business plan as the most important feature and outcome of their program (Matlay, 2008). However, their study based on interviews with 64 graduates of entrepreneurial education programs found that entrepreneurial education did not match actual outcomes of entrepreneurial knowledge and skillsets, but students were still satisfied with the education program. Martin & Karen (2015) introduced the concept of venture creation programs where universities offered programs that resulted in venture creation as action based learning (Martin & Karen, 2015). In their empirical study of 18 entrepreneurial programs in the USA and Europe, they found that venture creation related courses and technology transfer are one of the most effective ways to train entrepreneurs as an action-based course. Students enroll in the program and work towards launching a startup with the support of the university innovation department or venture capitalists and the university network. The programs were designed as a startup process; students learn by doing and from their reflections.

The university and the students were given equity on the venture creation project. A strict interview process must be conducted to screen the applicants for the program. Similar to top MBA programs, the success of the program is guaranteed by the profile of the students. Top MBA programs only accept students with minimum GMAT scores or strong career credentials; an example of a strong career credential would be holding a leadership role in a multinational company. The program guarantees success by predicting their graduates' future careers. The success of venture creation program also depends on the students they enroll. Entrepreneurship success is different from corporate success. High GMAT scores or career credentials do not guarantee success in entrepreneurship. Most of the time it contradicts as graduates with strong GMAT scores and good careers might not give up their jobs to become entrepreneurs. The criteria for selection are different, the screening process for these venture creation programs involved interviews and profile tests on the applicants' passion and commitment to the program. The MI program can learn from these venture creation programs and focus on recruiting students with the right profile. The current recruitment is based on the MBA format of GMAT scores. The MI program can also work with the innovation center to create action-based learning measures with a guaranteed platform for the student's capstone project to be incubated. They can also work with local research institutions and run joint venture creation programs. MI graduates are business innovators. They lack technical and product innovation know how while the research institution lacks entrepreneurial leaders to commercialize their products. This will result in more award-winning teams originating from the MI program.

8.9 Summary

In this last chapter, recommendations for further research on entrepreneurial leadership was discussed. Key areas for further research are expanding the research to surveying start-ups, conducting longitudinal study of internal teams in a multinational company, introducing other constructs such as entrepreneur passion and domain experience that may impact entrepreneurial leadership and types of entrepreneurial leadership at different stages of a start-up company.

Entrepreneurial leadership education and MI program recommendations were also discussed. The MI program can learn from venture creation programs in terms of recruiting the right profile of students for the program. The profile of an entrepreneur is different from that of an MBA student. The criteria for acceptance should be different in order to attract the right candidates to create award winning teams. Venture creation programs with research institutes or innovation centers were recommended as MI graduates lack technology and production innovation know how. An app-based survey toolkit can also be developed to create a cloud based social network of entrepreneurial leaders for networking and hiring. The data in the online app can be used for further research aimed at understanding entrepreneurial leadership.

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Appendices

1. Face to face Interview questions

- How was your overall experience in your Master of Science Innovation Capstone Project?
- What made it successful or not so successful?
- Looking back, how important was (team) leadership in achieving the capstone project goals?
- Did the team leader exhibit a particular type of leadership to drive innovation? If yes, how / in what ways?
- What about the other group members as co-leaders and/or followers?
- Did all this help to nurture a positive team climate (If yes, why? If not, why not?)?
- How important was age diversity in your project group (If important / highly appreciated, why? If not, why not?)?
- If it was highly appreciated: what effect did it have on team identification (sense of belonging)?
- How would you describe the affective tone within the team with regard to age-related matters (rather positive or not so positive?)?
- How did both leadership and the overall team climate impact the affective tone (positive and negative tone) in your group?
- What effect had it (if any) on performance-related team effectivity, e.g. as far as the innovative quality of your capstone project is concerned?

- If it was not highly appreciated or did not matter: what mattered the most in terms of team effectivity and high-quality innovation outcomes?
- Would it make sense to call the leadership behaviour prevalent in your group 'entrepreneurial' (if the need arises interviewer can refer to the EL scale)'? If yes, why? If not, why not (how would you categories it?)?
- What happened to your Capstone Project after your graduation?
- What advice do you have for future MI capstone teams and the MI management team with regard to the overall capstone project mgt. approach?

2. Survey questions

1. Entrepreneurial Leadership

My team leader…

- Often comes up with radical improvement ideas for the products/services we are selling.
- Often comes up with ideas of a completely new products/services that we could sell.
- Is willing to take risks for new projects.
- Has creative solutions to problems.
- Demonstrates passion for his/her work.
- Has a vision of the future of our business.
- Challenges and pushes me to act in a more innovative way.
- Wants me to challenge the current ways we do business.

2. Entrepreneurial Self Efficacy

- How much confidence do you have in your ability to brainstorm (come up with) a new idea for a product or service?
- How much confidence do you have in your ability to identify the need for a new product or service?
- How much confidence do you have in your ability to design a product or service that will satisfy customer needs and wants?
- How much confidence do you have in your ability to estimate customer demand for a new product or service?

- How much confidence do you have in your ability to determine a competitive price for a new product or service?
- How much confidence do you have in your ability to estimate the amount of start-up funds and working capital necessary to start your business?
- How much confidence do you have in your ability to design an effective marketing/advertising campaign for a new product or service?
- How much confidence do you have in your ability to get others to identify with and believe in your vision and plans for a new business?
- How much confidence do you have in your ability to network - i.e., make contact with and exchange information with others?
- How much confidence do you have in your ability to clearly and concisely explain verbally/in writing your business Idea in everyday terms?
- How much confidence do you have in your ability to supervise employees?
- How much confidence do you have in your ability to recruit and hire new employees?
- How much confidence do you have in your ability delegate tasks and responsibilities to employees in your business?
- How much confidence do you have in your ability to deal effectively with day-to-day problems and crises?
- How much confidence do you have in your ability to inspire, encourage, and motivate your employees?
- How much confidence do you have in your ability to train employees?
- How much confidence do you have in your ability to organize and maintain the financial records of your business?

- How much confidence do you have in your ability to manage the financial assets of your business?
- How much confidence do you have in your ability to read and interpret financial statements?

3. Team Climate

3.1 Team Vision

- How clear are you about your team's objectives?
- To what extent do you think they are useful objectives?
- How far are you in agreement with these objectives?
- To what extent do you think your team's objectives are clearly understood by other members of the team?
- To what extent do you think other team members agree with these objectives?
- To what extent do you think your team's objectives actually can be achieved?
- How worthwhile do you think these objectives are?
- How worthwhile do you think these objectives are to the organisation?
- How worthwhile do you think these objectives are to the wider society?
- To what extent do you think these objectives are realistic and can be attained?
- To what extent do you think members of your team are committed to these objectives?

3.2 Task Orientation

- Do your team colleagues provide useful ideas and practical help to enable you to do the job to the best of your ability?
- Do you and your colleagues monitor each other so as to maintain a higher standard of work?
- Are team members prepared to question the basis of what the team is doing?
- Does the team critically appraise potential weaknesses in what it is doing in order to achieve the best possible outcome?
- Do members of the team build on each other's ideas in order to achieve the best possible outcome?
- Is it a real concern among the team members that the team should achieve the highest standards of performance?
- Does the team have clear criteria which members try to meet in order to achieve excellence as a team?

3.3 Support for Innovation

- The team is always moving toward the development of new answers.
- In this team, we take the time needed to develop new ideas.
- Assistance in developing new ideas is available.
- The team is open and responsive to change.
- People in this team cooperate in order to help develop and apply new ideas.
- People in this team are always searching for fresh, new ways of looking at problems.

- Members of the team provide and share resources to help in the application of new ideas.
- Team members provide practical support for new ideas and their application.

3.4 Participative Safety

- We share information generally in the team rather than keeping it to ourselves.
- We have a 'we are together' attitude.
- We all influence each other.
- People keep each other informed about work-related issues in the team.
- People feel understood and accepted by each other.
- Everyone's view is listened to, even if it is in a minority.
- There are real attempts to share information throughout the team.
- There is a lot of give and take.

3.5 Interaction Frequency

- We keep in regular contact with each other.
- We interact frequently.
- We keep in touch with each other as a team.
- Members of the team meet frequently to talk both formally and informally.

4. Appreciation of Age Diversity

- Our team profits from contributions from older as well as younger team members.

- In our team, one can learn new things because of the different perspectives of older and younger team members.
- In our team, we deal constructively with proposals coming from team members of diverse age.
- A team is more effective if its members belong to different age groups.
- A team is more effective if its members has diverse ages.
- Team climate is better if team members have diverse ages.
- If asked for a description of our team, age composition comes in my mind (e.g. three younger and two older colleagues).
- Age differences between my colleagues are very real for me.
- Sometimes I think about the age differences in my team.
- The age differences of our team members are considered when it comes to team decisions (e.g. with regard to assignments).
- If problems with our team arise, this is due to age differences in our team.
- In our team we do talk about our age differences.

5. Innovation Work Behavior

- Our team creates new ideas for difficult issues.
- We search out networking methods, techniques or instruments.
- Our team generates original solutions for problems.
- We mobilise support for innovative ideas.
- Our team acquires approval for innovative ideas.
- We make important organizational members enthusiastic about innovative ideas.
- Our team transforms innovative ideas into useful applications.

- We introduce innovative ideas into the work environment in a systematic way.
- Our team evaluates the utility of innovative ideas.

3. Entrepreneurial Leadership assessment kit (Renko et al., 2015)

- Do I often come up with radical improvement ideas for the products/services we are selling?
- Do I often come up with ideas of a completely new products/services that we could sell?
- Am I willing to take risks for new projects?
- Do I have creative solutions to problems?
- Are you passionate about your work?
- Do you have a vision of the future of our business?
- Do I challenge and pushes my members to act in a more innovative way?
- Do I motive my members to challenge the current ways we do business?

4. Entrepreneurial Self Efficacy assessment kit (McGee et al., 2009)

- How much confidence do you have in your ability to brainstorm (come up with) a new idea for a product or service?
- How much confidence do you have in your ability to identify the need for a new product or service?
- How much confidence do you have in your ability to design a product or service that will satisfy customer needs and wants?
- How much confidence do you have in your ability to estimate customer demand for a new product or service?
- How much confidence do you have in your ability to determine a competitive price for a new product or service?
- How much confidence do you have in your ability to estimate the amount of start-up funds and working capital necessary to start your business?
- How much confidence do you have in your ability to design an effective marketing/advertising campaign for a new product or service?
- How much confidence do you have in your ability to get others to identify with and believe in your vision and plans for a new business?
- How much confidence do you have in your ability to network - i.e., make contact with and exchange information with others?
- How much confidence do you have in your ability to clearly and concisely explain verbally/in writing your business Idea in everyday terms?
- How much confidence do you have in your ability to supervise employees?
- How much confidence do you have in your ability to recruit and hire new employees?

- How much confidence do you have in your ability delegate tasks and responsibilities to employees in your business?
- How much confidence do you have in your ability to deal effectively with day-to-day problems and crises?
- How much confidence do you have in your ability to inspire, encourage, and motivate your employees?
- How much confidence do you have in your ability to train employees?
- How much confidence do you have in your ability to organize and maintain the financial records of your business?
- How much confidence do you have in your ability to manage the financial assets of your business?
- How much confidence do you have in your ability to read and interpret financial statements?

5. Appreciation of Age Diversity assessment kit (Wegge et al., 2011)

- Our team profits from contributions from older as well as younger team members.
- In our team, one can learn new things because of the different perspectives of older and younger team members.
- In our team, we deal constructively with proposals coming from team members of diverse age.
- A team is more effective if its members belong to different age groups.
- A team is more effective if its members has diverse ages.
- Team climate is better if team members have diverse ages.
- If asked for a description of our team, age composition comes in my mind (e.g. three younger and two older colleagues).
- Age differences between my colleagues are very real for me.
- Sometimes I think about the age differences in my team.
- The age differences of our team members are considered when it comes to team decisions (e.g. with regard to assignments).
- If problems with our team arise, this is due to age differences in our team.
- In our team we do talk about our age differences.

6. Entrepreneurial leadership course outline

6.1 Entrepreneurial leadership executive workshop course

The objective of this workshop is to expose participants to entrepreneurial leadership. In this workshop, participants will examine their own entrepreneurial leadership through the entrepreneurial assessment toolkit. Find out gaps on their leadership style and areas that can help them close the gap. The course will also invite guest speaker an entrepreneurial leader in the industry to speak with the participant.

Duration: 3-hour workshop.

1. Introduction to entrepreneurial leadership. How to lead and motivate your team to recognize and commercialize opportunities. How to act and think like an entrepreneurial leader.
2. Entrepreneurial leadership assessment toolkit. Team formation and gap analysis.
3. Guest speaker and lecturer, an entrepreneurial leader

6.2 Entrepreneurial leadership Undergraduate and Master level module

The objective of this Undergraduate/Master level course is to introduce the concept of entrepreneurial leadership style in start-ups and innovation teams. In this course, students will learn tools that help examine the entrepreneurial leadership style, gap analysis of team members' entrepreneurial leadership, how the entrepreneurial leadership style affects team climate and case studies of successful entrepreneurial leaders. The course will also invite a guest lecturer, an entrepreneurial leader in the industry and organise a site visit to an entrepreneurial work environment.

Duration: Undergraduate 12 weeks. Master 4 weeks

1. Introduction to different leadership styles and entrepreneurial leadership
2. How to act and think like an entrepreneurial leader.
3. Barriers of implementing entrepreneurial leadership (internal and external environment). How to overcome barriers.
4. Introduction to entrepreneur start-up process and start-up environment.
5. Entrepreneurial leadership assessment toolkit. Team formation and gap analysis.
6. Case studies of successful entrepreneurial leaders.
7. Guest lecturer ('entrepreneurial leader')
8. Site visit – entrepreneurial eco system