An Integrative Cognitive-Behavioural Framework for Predicting Collective Intelligence in Small Teams

By

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ABSTRACT

Leaders' capability to empower their employees to form small intelligent teams will profoundly impact the competitiveness of their organisations, considering that unrelenting disruption and fierce competition are the norms in today's business landscape. In part, owing to this reason, the study of collective intelligence (*CI*) has emerged as a notable interdisciplinary body of knowledge in recent years.

Scholars have regarded *CI* as the socio-psychological concept that accounts for how team members can derive superior ideas leading to higher performance when working together as collectives instead of as individuals. The study of *CI* in adults is relatively new ground for management science and various research gaps persist. Not only does a well-validated *CI* predicting framework not exist, many *CI* studies were not carried out in settings that closely resemble the real-life organisational context. Some researchers even contest the legitimacy and the existence of *CI*.

To study *CI* in small teams can be challenging. One of the pertinent challenges is that factors attributing towards the development of individual adults' intelligence are not well-understood. Newly emerged studies have further highlighted the poor correlation between scores generated from widely-adopted intelligent quotients (IQ) tests and adults' intelligence. Other studies have asserted that one cannot simply assign adults' IQ as the results of their biological attributes and further advocate that it is more accurate to study what the cognitive-behaviours are that influence the intelligence of adults in the day-to-day context. In a similar trend of logic, *CI* researchers have greatly accentuated that an integrative cognitive-behavioural framework that can predict the CI of the small teams is well-needed but has not yet been established.

Taking these scholarly recommendations as the basis for the research design, this study regards *CI* as an emergent asset that arises from the cognitive-behaviours between team members during the problem-solving and decision-making processes. This study assessed the causal relations between twenty hypotheses of three cognitive-behavioural clusters, viz. resource acquisition and utilisation (RAU), strategic thinking (ST) and team members exchange (TMX), and the *CI* of the Action Learning Project (ALP) teams based on the outcomes of ALP competitions. The lack of academic consensus on how these twenty cognitive-behaviours impact the *CI* of small teams provides added novelty to this research. Considering that ALP teams are subjected to an environment that shares a fair amount of similarities with the real-life corporate scenarios but with less interference by other complex issues, the empirical findings allow researchers to further their scholarly knowledge, practitioners to design better ALP content and leaders to empower their teams.

A questionnaire was developed and tested before inviting research participants to rate their own cognitive-behaviours as individuals and concurrently to assess the same cognitive-behaviours of their teams as collectives. Seeing that *CI* studies commonly rely on participants' self-reporting data about the perceptions on their own cognitive-behaviours only but hardly having been probed and compared against the outcome of the participants' perceptions of their teams as collective, contrasting two surveying approaches allow this study to conclude which approach is more appropriate for *CI* related studies.

The responses of 406 delegates from 12 programmes were deemed fit for use, and the datasets were subjected to various statistical calculations. The findings revealed that the two datasets obtained from the two surveying approaches produced two slightly different structural path models after they were subjected to both descriptive and inferential statistic techniques. The hypotheses were reassigned into different factor dimensionalities, and subsequently, the partial least squares structural equation modelling calculations were applied to these two models. The statistical results indicated that the H-null for one of the 20 hypotheses must be rejected. An explanation was offered.

Subsequently, the factors accepted were ranked according to the degree of potential impact on the overall *CI* of the ALP teams. The plausible rationales and the implications of this ranking are discussed. In addition, it was found that the datasets obtained from the “Rate Team” surveying approach produced a slightly better *CI* predictability than the ones obtained from the “Rate Self” surveying approach. The suitability of the surveying approach for *CI* related study is then discussed.

Despite the differences between these two structural path models being marginal, this study observed a *profound* contrast of the key insights of each model. For the model generated from “Rate Self” surveying approach, it underscores the importance of the RAU cognitive-behaviours. Whereas the model generated from “Rate Self” surveying approach advocates that small teams must pay equal emphasis to all three types of cognitive-behaviours (RAU, ST and TMX) in order to boost overall *CI* of the ALP teams. The findings challenge the popular management philosophy of “culture eats strategy for breakfast”. Instead, the outcome of the study draws attention to the equal importance of gathering and utilising resources, thinking strategically and harnessing helpful styles of interaction among team members. The limitations and contributions were discussed. Recommendations for future studies are also proposed based on the findings uncovered.

KEY WORDS

Collective intelligence; team innovation; cognitive-behaviours; strategic thinking; team-member exchange, boundary-spanning.

AFFIDAVIT

I hereby confirm that this thesis is my own written work and all quotations taken from other publications were cited accordingly to my best knowledge.

The content of the thesis has not been submitted in a substantially similar version to another examination board nor has any content been published as it is elsewhere.

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Signature

Date: 10.August.2020

LIST OF ABBREVIATIONS

α	Cronbach's alpha
β	Path coefficient
Δ	Differences
μ	Mean
σ	Standard deviation
P	p-value
χ^2	Chi square
ALP	Action learning project
AVE	average variance extracted
CEE	Customised executive education
CFA	Confirmatory factor analysis
CI	Collective intelligence
CRI	Composite reliability index
EFA	Exploratory factor analysis
f^2	Cohen's f squared
GoF	Goodness of fit
HTMT	Heterotrait-Monotrait ratio of correlations
KMO	Kaiser-Meyer-Olkin
L&D	Learning and development
Not Win	All remaining teams that did not win the ALP competitions
Path	The causal direction in which a factor is connected to a latent variable
PLS-SEM	Partial Least Squares Structural Equation Modelling
PLS-SEM	Partial Least Squares
Q^2	Stone-Geisser test

R^2	Coefficient of determination
Rate Self	Surveying approach that requests one to rate one's cognitive-behaviours
Rate Team	Surveying approach that requests one to rate the general cognitive-behaviours of one's own ALP team
RAU	Resource acquisition and utilisation
Rho_A	Reliability coefficient
SEM	Structural Equation Modelling
SRMR	standardized root mean square residual
ST	Strategic thinking
TMX	Team member exchange
VIF	Variance inflation factor
Win Only	The data of the teams that won the ALP competitions

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CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter shall deliberate the background of the study. It will then highlight the knowledge gaps in the body of knowledge and discuss the problem statements for this study. Subsequently, the purpose of this study will be presented, and the significance of the findings, from both perspectives of academic research and business practices, shall be emphasised. Finally, this chapter provides the delimitations and the assumptions of the study before presenting the structure of the thesis. Figure 1.1 indicates the flow and key components of Chapter 1.

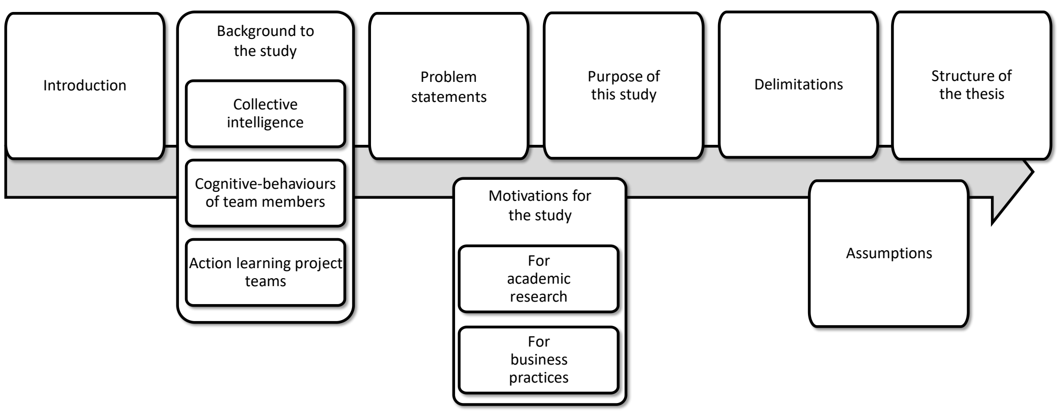

Figure 1. The flow and the key components of Chapter 1 (author's own)

1.2 Background to the study

Three interrelated subsections will be presented in this section. Firstly, a brief explanation of the theoretical construct collective intelligence (*CI*) will be provided. Thereafter, the rationales of why one should examine the cognitive-behaviours of members of small teams when attempting to study *CI* will be presented. (For this study, the term "team" is defined as a unit of collaborators, assembled formally or informally in the form of syndicate, group or cohort, who aim to achieve a shared objective collectively). The last subsection shall succinctly discuss why it is of value to make use of Action Learning Project teams as the unit of analysis for this study.

1.2.1 Collective intelligence

Modern societal trends (Stieglitz, Mirbabaie & Milde, 2018) for knowledge creation, sense-making and problem-solving have sturdily shifted away from relying on individuals' dispersed efforts to exploring synergies within the collectivist approaches. Despite that many civilisations have had a long history in adopting the collectivism ethos to create and pass on wisdom from generation to generation since ancient days (Fink, Holden, Karsten & Illa, 2005; Mulgan, 2018b), one can argue that the progression and the pervasiveness of collectivist movements were drastically accelerated by the rapid advancement of cybertechnology and internet in the early 1990s (Lévy & Bononno, 1997). Even though nations around the globe do differ profoundly in their readiness for knowledge economy (Khalil & Marouf, 2017), contemporary societies are beginning to favour the practices of participatory ideation and leaders are making a concerted effort to promote convergence of resources instead of endorsing individualism (Mulgan, 2018b). The increase in the interconnectedness between individuals also contributes towards the interdependency between communities and further permits stakeholders to leverage various forms of diversity in addressing complex challenges and creating invaluable opportunities (Bowen et al., 2017; Elia & Margherita, 2018; Jenkins, 2014).

Owing to the seismic shift of societal norm, as well as the sophistication of business challenges in current time, today's organisations begin to embrace the collectivist approach as the fundamental ethos in boosting their growth and innovativeness (Ahn & Hong, 2019; An, Zhao, Cao, Zhang & Liu, 2018; Hecker, 2012; Pian, Jin & Li, 2019; Song, Liu, Gu & He, 2018). Some studies have suggested that the magnitude of success of corporate entrepreneurship and innovation endeavours correlates positively with the unit-level collective efficacy, and this efficacy can be attributed to how small teams promote and enhance their *CI* (Chang, Chang & Chen, 2017; Elia, Margherita & Petti, 2016).

Some scholars have posited that *CI* is the socio-psychological concept that accounts for how individuals can derive superior ideas leading to gratifying outcomes when working together in a collective unit rather than individually (Mulgan, 2018a; Woolley, Chabris, Pentland, Hashmi & Malone, 2010). While there is a long history in investigating the *CI* in animal species (Couzin, 2009; Rosenberg et al., 2018), the study of this construct in adults is somewhat a relatively new ground (Salminen, 2012; Wladawsky-Berger, 2018; Woolley et al., 2010).

In recent years, the study of *CI* has emerged as a notable interdisciplinary body of knowledge in management science with the research agendas covering a broad spectrum of domains. Empirical studies continue to upsurge from these popular domains, *inter alias*, the performance of groups and teams (Mayo & Woolley, 2017; Woolley et al., 2010), technology-aided decision-making (Leimeister, 2010; Malone, 2018; Mason & Watts, 2012; Mulgan, 2018a), crowd wisdom (Davis-Stober, Budescu, Dana & Broomell, 2014; Giles, 2005; Malone, Laubacher & Dellarocas, 2010;

Vercammen, Ji & Burgman, 2019; Yu, Chai & Liu, 2018), prediction of markets (Arrow et al., 2008; Pan, Altshuler & Pentland, 2012), to corporate innovation (Alkema, Levitt & Chen, 2017; Boudreau, Lacetera & Lakhani, 2011; Feldmann, Fromm, Satzger & Schüritz, 2019; Whelan, Parise, De Valk & Aalbers, 2011), learning (Anderson Jr & Lewis, 2014; Grimon, Meza, Vaca-Cardenas & Monguet, 2017; Lévy, 2015; Zhang, Shang, Luan, Wang & Chua, 2016) and knowledge management (Ebner, Leimeister & Krcmar, 2009; Huang & Chin, 2018; Quinn & Bederson, 2011). However, despite this topic is attracting scholarly attention, well-validated instruments for assessing or predicting *CI* in small teams remain in scant supply (Bates & Gupta, 2017; Pentland, 2007; Woolley et al., 2010; Woolley, Kim & Malone, 2018). Moreover, typical *CI* studies to date are not been investigated within conditions that are similar to the organisational context (Kaur & Shah, 2018; Paletz & Schunn, 2010; Woolley et al., 2015).

To date, the existence of *CI* within small teams and the antecedents of *CI* remain as contentious topics (Balijepally, Mahapatra, Nerur & Price, 2009; Bates & Gupta, 2017; Credé & Howardson, 2017; Reiter-Palmon & Leone, 2019; Woolley, Aggarwal & Malone, 2015; Woolley et al., 2018; Yu et al., 2018). While many scholars advocated the legitimacy and benefits of *CI* (Boder, 2006a; Feldmann et al., 2019; Steyvers & Miller, 2015; Vercammen et al., 2019; Woolley et al., 2010; Woolley et al., 2018; Yun, Jeong, Zhao, Hahm & Kim, 2019), some researchers have suggested that small teams may not be better at generating more and better ideas than individuals working independently (Balijepally et al., 2009; (Reiter-Palmon & Leone, 2019). Others argue that the *CI* of small teams is not a well-validated construct as the intelligence of the groups simply correlates with the intelligence of the individual team members (Bates & Gupta, 2017). Credé and

Howardson (2017) even further suggested that there is insufficient evidence of the existence *CI* based on their empirical study and dispute the existence of *CI* in the first place. Owing to these disparities, *CI* research communities have thus been urging the research communities to invest more effort into understanding this important topic within the context of team science (Aggarwal & Woolley, 2018; Choudhury & Haas, 2018; Credé & Howardson, 2017; Grimon et al., 2017; Kaur & Shah, 2018; Woolley & Fuchs, 2011; Yu et al., 2018). The outcomes of this study may address selected tensions within the *CI* body of knowledge and reduce the disputes of the validity of *CI* (Credé & Howardson, 2017; Reiter-Palmon & Leone, 2019; Woolley et al., 2018). The findings can also serve as the preliminary instrument that can be further developed into a full-fledge cognitive-behavioural scale to predict the level of *CI* within small teams.

1.2.2 Cognitive-behaviours of team members

A recent article titled "Adult intelligence: The construct and the criterion problem" published in a high impact peer-review journal, Perspectives on Psychological Science, (impact factor 2018 = 10.577) underscores the discerning disconnect between various widely-adopted IQ (intelligence quotient) type tests and our contemporary understanding on what makes an adult intelligent. The correlations between the scores generated from these tests and adult intelligence are insignificant (Ackerman, 2017). The author identifies that the ultimate cause of the failure was due to the fact that these tests do not take the "(cognitive-)behaviors that are directly relevant to intellectual challenges in the day-to-day activities of adults" outside of the laboratory setting into consideration (Ackerman, 2017, p. 995). The article further stated that, "Predicting individual differences in these behaviors can be expected to yield better understanding of the construct of adult intelligence as fundamentally and qualitatively different from child intelligence, more comprehensive understanding of the effects of aging on adult intellectual development, improved prediction of individual differences in work and nonwork behaviors, and satisfactory criteria for evaluating the effectiveness of interventions designed to improve adult intelligence" (Ackerman, 2017, p. 995).

Factors attributing towards the development of adult intelligence are highly complex, and many factors often form a wicked-type of co-dependent interrelationship which makes the empirical investigations challenging (Ackerman, 2017; Laborda, Elosúa & Gómez-Veiga, 2019; López-Robles, Otegi-Olaso, Gómez & Cobo, 2019). Newly emerged studies further suggest that one cannot confidently assign the causality between the intelligent quotient (IQ) and our biological attributes, such as structural brain health, genders, age, ethnicity and the likes (Ackerman, 2017; Habeck, Eich, Gu & Stern, 2019; Laborda et al., 2019). Moreover, as the level of "intelligence" of an adult should not merely be considered as the end score of some form of tests, considering that these tests can often be distorted and affect the accuracy of the result (Von Stumm, 2014), this study shall align itself with the recommendations proposed by Ackerman (2017) and narrows its focus on unpacking how a group of adults formed teams and used selected cognitive-behaviours to solve business related challenges as the means to investigate *CI*.

Other scholars in recent years have also begun to recognise that *CI* should be regarded as an emergent asset that arises from the exchanges between individual members when they socialise and interact with each other during the problem-solving and decision-making processes

(Bernstein, Shore & Lazer, 2018; Case & Bereiter, 1984; Paletz & Schunn, 2010; Steyvers & Miller, 2015). The study, therefore, adopts this argument and intend to assess causality between the level *CI* of created in small teams and the cognitive-behaviours exhibit by the team members individually and collectively (Case & Bereiter, 1984; Steyvers & Miller, 2015; Woolley et al., 2010). A cognitive-behavioural scale that can serve as the antecedents to predict the *CI* within small teams but validated from the theoretical underpinnings beyond the traditional intelligence tests does not exist (Kaur & Shah, 2018). Scholars have thus called upon the research communities to investigate the antecedents and factors that made some groups more 'intelligent' than others (Hansen & Vaagen, 2016; Kaur & Shah, 2018; Thayer, Petruzzelli & McClurg, 2018; Woolley et al., 2015). In addition, Paletz and Schunn (2010) have asserted that studies on team innovativeness to date typically lack the integration of socialisation dimension. An integrative cognitive-behavioural framework that can predict the *CI* of the small teams is well-needed but has not yet been established (Paletz & Schunn, 2010; Suran, Pattanaik & Draheim, 2020; Yu et al., 2018).

1.2.3 Action learning project teams

In order to develop an integrated cognitive-behavioural framework that is useful to organisations, one should not merely study *CI* using trivial tasks that do not closely resemble the real-life organisational context. Asking the participants to play simple and non-business-related games or simulations in groups then extrapolate the findings to predict the *CI* of teams involved in corporate entrepreneurship and innovation types of strategic initiatives would not be ideal. However, studying *CI* of teams in a corporate setting in real-life can be a challenging task. This is owing to these three key reasons. Firstly, various complex organisational factors may come into play, and these factors cannot be isolated, nor eradicated, easily (Franke & Foerstl, 2018). Secondly, different teams, within an organisation or between different organisations, experience very different conditions (Driskell, Salas & Driskell, 2018), and it would be difficult for this study to normalise the research findings against these conditions. Lastly, teams are not in competition against one another, and therefore it would be difficult to compare the cognitive-behaviours of the team members of different teams against each other when the study cannot utilise a set of common benchmarks to validate one teams against each other. Therefore, adopting a quasi-laboratory setting that can significantly reduce or completely remove these above-stated impeding challenges will be the preferred way forward when attempting to study *CI*, leading to findings of high applicability to organisational science.

In recent years, organisations have been increasingly reliant on customised executive education (CEE) to boost the quality of their human capital (Conine Jr & Peratoner, 2019; Day, Fleenor, Atwater, Sturm & McKee, 2014; Haskins & Shaffer, 2013; Nicolini, Gherardi & Yanow, 2003). Scholars have also suggested that incorporating an aspect of action learning can lead to gratifying returns (Boshyk, 2016). Action learning by definition is a process involving delegates working together in small teams to tackle an actual business problem of high relevance to organisations that the delegates are affiliated to, while allowing the delegates to apply the knowledge gained from their CEE programmes as individuals and as a team under a more controlled condition. By the end of the ALP journey, commonly stretched over several months, each team will formulate an innovative business concept to address the particular action learning challenge assigned to the team and present the ideas to a panel of judges. The judges will then adjudicate and award a winning team based on the information received (Boshyk, 2016; Conine Jr & Peratoner, 2019; Robertson & Bell, 2017). As the panel of judges consists of subject matter experts and senior leaders of the organisations that the delegates are affiliated to, the causal relationship between the cognitive-behaviours exhibited by the ALP team members and the outcome of the ALP process can be investigated. Furthermore, due to the fact that the Learning and Development practitioners of the companies that implemented the CEE programme typically ensure that there is a uniformity of the level of seniority among the delegates within a particular programme, the concern of potential complications that may arise from the disparity of work experience among the team members is drastically reduced. The senior leaders of the organisation generally endorse the ALP topics before all ALP team work on these business challenges. The endorsement reduces the unnecessary complication owing to the lack of management support – an important factor that critically affects the outcome of corporate entrepreneurship and innovation (Kuratko, Hornsby & Covin, 2014).

To ascertain the causality between the outcome of ALP competitions and the cognitive-behaviours of the ALP team members, both as individuals and as a team, can serve as a useful proxy for studying *CI* in teams in the real-life organisation. More detailed discussion of the ALP process can be found in Chapter 2.

1.2.4 Self-reporting data collecting methods

At this point, it is critical to accentuate that many team science related studies utilise participants' self-reporting data to evaluate how they see certain aspects or attributes of themselves. The majority of the studies do not ask the participants to validate how their teams may act as a collective. Management science researchers have postulated that self-report research methods may threaten the validity of business research and hamper the development of organisational behaviour body of knowledge (Cunningham & Turk, 2017; Donaldson & Grant-Vallone, 2002; Van de Mortel, 2008). Some socio-psychology studies dating back to the 1970s have suggested that, overall, individuals' judgments on their behaviours differ from how they judge others (Adams-Webber & Davidson, 1979; Jones & Nisbet, 1971; Lay, Ziegler, Hershfield & Miller, 1974). Such discrepancy leads to the self-reporting bias (Arnold & Feldman, 1981; Auer & Griffiths, 2017; Cunningham & Turk, 2017; Fisher, 1993; Hill & Roberts, 1998; Roberts, 1995; Rowland, 1990; Symons & Johnson, 1997; Spector, 1987). Therefore, this study intends to leverage the opportunity to draw conclusions on which would be a better surveying method for *CI* investigation, by comparing how participants score their own cognitive-behaviours against the outcome of the ALP competitions versus how they score the general cognitive-behaviours of the team members as a whole against the outcome of their ALPs.

In summary, the existence and the antecedents of *CI* remain as two important topics for team science. Yet, the consensus on these topics has not been reached conclusively within the relevant research communities to date. Not only is there a scarcity of the frameworks which can account for how teams can harness *CI*, these limited frameworks were constructed either through literature review (Grimon et al., 2017; Kaur & Shah, 2018; Suran et al., 2020; Yu et al., 2018) or narrowly focusing on a few constructs (Engel et al., 2015; Woolley et al., 2015; Woolley et al., 2010). These frameworks are not developed from studies that resemble business settings. The *CI* predictive framework that comprises interconnected aspects of cognitive-behaviours of the team members has not been established (Kaur & Shah, 2018; Paletz & Schunn, 2010; Suran et al., 2020; Woolley et al., 2015; Yu et al., 2018). In addition, more empirically-validated contributions are required to deliberate which data collection methods would lead to a more superior outcome within the context of team science.

1.3 Problem statements

This study aims to address these four problem statements listed below.

Firstly, to date, as deliberated in the previous section, limited *CI* frameworks exist, and many of them have not been empirically validated against certain business performance. A comprehensive framework for *CI* remains scarce, and scholars have yet to produce an integrative cognitive-behavioural framework to serve as a predictor of *CI*. Apart from the simple framework (which was not validated against any business performance) proposed by Kaur and Shah (2018), similar prediction tools that can forecast the intelligence of the teams do not exist. The majority of research agendas of *CI* studies tend to investigate a few factors or use simple challenges that are not related to the business performance (Kaur & Shah, 2018; Mayo & Woolley, 2017; Woolley et al., 2010; Woolley et al., 2018). This study aims to address this problem by developing an integrative cognitive-behavioural framework that can lead to the prediction of *CI*.

Secondly, the cognitive-behavioural constructs to be included for this framework development have never been validated against *CI*. As a matter of fact, some of these cognitive-behaviours, such as the five elements of strategic thinking principles advocated by Liedtka (Liedtka, 1998), have been widely adopted in the management science communities without ever being subjected to empirical validation. The findings of this study will serve as the empirical evidence not only to provide a novel understanding of the causality between *CI* and these key cognitive-behavioural constructs, but also to validate the usefulness of constructs for the very first time.

Thirdly, while the self-reporting surveying approaches have been suggested to be problematic for some research areas but not as much for other areas (Auer & Griffiths, 2017; Cunningham & Turk, 2017; Donaldson & Grant-Vallone, 2002; E. E. Jones & Nisbet, 1971; Lay et al., 1974; Reiter-Palmon, Robinson-Morral, Kaufman & Santo, 2012; Van de Mortel, 2008), this study intends to validate which of the two survey methods, participants rating their own cognitive-behaviours or the general cognitive-behaviours of their respective teams, is more suited for the investigation of *CI* and team science.

Lastly, the existence of CI is still a contentious topic in the research communities. This study intends to leverage the research findings to deliberate the existence of *CI*.

1.4 Motivations for the study

1.4.1 For academic research

The main motivations for this study are to address the problem statements included in the previous section and make contributions towards the scholarly understanding of *CI* in small teams. Not only can the findings strengthen the scholarly pursuits in unravelling the existence of *CI*, the integrative cognitive-behavioural framework can also be developed into a robust predictive scale. The advancement in our understanding on *CI* will further benefit various other areas of research such as topical research agendas of relevance to team effectiveness, collective psychology, leading team in the modern era and group-based technology-assisted intelligence (Barlow & Dennis, 2016; Friedrich, Griffith & Mumford, 2016; Larson & DeChurch, 2020; Raghuram, Hill, Gibbs & Maruping, 2019). Moreover, findings of this study can be extrapolated to contribute towards the development of new research focuses on noteworthy research subdomains emerging in recent years, such as the relationship between *CI* and open innovation within industries (Yun et al., 2019), co-creation within the digital landscape (Senyo, Liu & Effah, 2019), collective intrapreneurship within organisations (Heinze & Weber, 2016), informal collaboration within communal innovation space (Morel, Dupont, Boudarel & Uzunidis, 2018), institutional coopetition (Elmoukhliss, Renard, Zhao & Balagué, 2016), strategic project groups (Hansen & Vaagen, 2016) and the likes. Lastly, findings can provide new recommendations to CEE, ALP and organisational learning research communities (Boshyk, 2016; Edmonstone, Lawless & Pedler, 2019; Haskins & Shaffer, 2013; IMD, 2005).

Quoting from notable article titled: "30 years of intelligence models in management and business: A bibliometric" published in a high-impact journal, International Journal of Information Management review, López-Roblesa, Otegi-Olasoa, Porto Gómezb and Cobo (2019, p. 36) stated that "some future work is necessary to provide a more in-depth examination of the field of Intelligence. This work should include a conceptual analysis of the definitions of Intelligence, along with an identification of common elements shared between such definitions. In addition, there is a need to explore their points of interaction, complementarity, maturity, and their application to present-day organizations, along with a definition of an integral model of

Intelligence.” The advancement of our understanding of *CI* will contributed towards the progression of the research topics identified by these scholars.

1.4.2 For business practices

As Kaur and Shah (2018, p. 535) stated, “the combined knowledge and expertise of a diverse group, has become the order of the day”, how leaders can assist their organisations to foster competitiveness through the wisdom of the collectives becomes a very noteworthy topic in the era of the Fourth Industrial Revolution (Mello & Rentsch, 2015; Senyo et al., 2019; Svahn, Mathiassen & Lindgren, 2017). The findings of this research can assist the organisations to improve their effectiveness in promoting various collective pursuits of value creation, such as to applying the insights generated from this study in aspects of organisational learning (C. H. Lin & Sanders, 2017), cascading organisational agility across teams (Rigby, Sutherland & Noble, 2018), virtual teams (Barlow & Dennis, 2016), leveraging ecosystems through digital platforms (Senyo et al., 2019) and collective decision making (McHugh et al., 2016). In addition, the findings of the research can provide practical clues for industrial psychologists, recruiters and organisational learning practitioners to develop effective tools to match the right candidates to the right jobs or assessing specific attributes of the team members and develop semi-bespoke training initiatives to accelerate employees’ cognitive-behavioural shifts.

1.5 Purpose of the study

The purpose of this study is to achieve these four objectives:

i. To measure, evaluate, determine and predict the extent of influence of the selected constructs within three cognitive-behavioural clusters on the *CI* of small team.

ii. To measure, evaluate, determine and predict which surveying approach, participants rating themselves or rating their team member as a collective, will lead to a more superior result for the study of *CI*.

iii. To construct a novel integrative cognitive-behavioural framework for the prediction of *CI* of small teams.

iv. To leverage the findings to deliberate whether *CI* is indeed a valid construct or not.

1.6 Delimitations

This study comes with a range of delimitations, and they are as follows:

1) ***National factors:*** considering that this research is conducted in South Africa, this study cannot guarantee that the national culture dimensions did not influence the perceptions of the research participants (Hofstede, 2011).

2) ***Organisational factors:*** A wide range of other organisational factors affecting the innovativeness of the team, such as leadership, corporate culture, organisational boundaries and organisational politics may affect how the team make progress with their ALPs. While utilising ALP teams to explore *CI* antecedents can reduce the potential complications as the result of the discrepancy in team-sizes, the disparity of delegates' maturity levels and organisational politics, this study cannot rule out the potential effects

of these factors. While the participants of the programme are typically grouped into different ALP teams randomly, this study cannot guarantee that the potential prior interpersonal dynamics between members within an ALP team may not affect the exchanges between these members during the ALP journey. However, it is worth noting that as long as the participants can critically evaluate the cognitive-behaviours exhibit by them and their teams as collectives, the potential effect of the prior relationship on the accuracy of the data is reduced.

3) ***Quality of the judges:*** ALP journeys typically conclude with a formal competition and the adjudication of the winning project for each competition is evaluated by a panel of judges. These panels usually consist of five or more senior leaders within the organisation and subject matter experts. Before awarding the score to each ALP team, the judging panel will hold discussions amongst themselves, and such discussions can reduce the biases of the judges. While the judges can keep each other in check, this study cannot guarantee that all judges will evaluate the business concepts produced by the ALP teams without any inherent bias.

4) ***CEE Programme factors:*** The scope of work for the ALP teams is more slanted towards ideation and preliminary prototyping. Other critical phases of innovation, such as implementation and growth, may present their own sets of unique challenges. Hence, the result obtained from this study may be more suited for predicting the *CI* of ideation related challenges. Typically, each ALP team in a CEE programme is assigned to an ALP

coach. Despite all coaches involved are seasoned professionals, and their role is to guide the team members, but not to drastically affect the progress of the teams, this study cannot dispute the possibility that the ALP coaches involved may have influenced the team members to adopted particular styles of thinking or interaction that are not common to the participants. Moreover, considering that the style of CEE programmes implemented are generally, nurturing and supportive, it may have slightly influenced how participants score themselves and their teams. However, once again, as long as the participants can critically evaluate the cognitive-behaviours exhibit by them and their teams as collectives, the potential effect of these delimitations will be reduced. For example, irrespective of how the participants' CCE programmes and coaches have encouraged them to think and act, the datasets obtained will still be of superior value when the participants can assess the questionnaire objectively.

5) ***Sampling factors:*** The researcher has clearly announced to the potential research participants that the participation of this study is on a voluntary basis, and some delegates of the programme have exercised this right by declining to participate in the study. As the study aimed to solicit inputs from all ALP team members while their memory was still fresh, the data collection was conducted right after all ALP teams have completed the last task of their ALP journeys and before the judges delivered their verdicts. By so doing, it reduces the influence of the Dunning-Kruger effect, memory bias and hindsight bias (Blank & Nestler, 2007; Schlösser, Dunning, Johnson & Kruger, 2013). However, this study cannot eradicate the sentiment that while some participants may have felt relieved

during the time of the data collection, some may still be slightly anxious about the verdict. The timing to invite the ALP team members to complete the questionnaire could have somewhat influenced the emotional states of the participants and potentially affect the quality of the data. But seeing that the majority of delegates do feel more relieved after having presented their ALP concepts to the judges, and other well-established socio-psychology studies have gathered data from straight after participants have gone through a stressful experiment (Kim et al., 2017), this delimitation should not derail the study substantially.

1.7 Assumptions

This study made the following key assumptions:

- All participants partaking in the research process will critically and ethically reflect their realities when responding to the questions of this study.

- All participants of this study have sufficient context and experience to respond to the questions owing to the selection process of the CEE programme and having taken part in the ALP process.

- The participants are given sufficient time to respond to the survey to ensure the credibility of their inputs.

- The emotion states of the participants will not significantly skew the scoring process (and this topic will be deliberated in more detail in Chapter 2)

- The ranks of the delegates are meticulously validated by the Learning and Development (L&D) practitioners of their companies before the delegates are invited to enrol for the programme. Based on the rigorous process of validation (to be discussed in more detail in Chapter 2), this study will assume the ranks of the delegates who enrolled for the middle and senior management development programmes genuinely match the level of CEE programmes.

- Considering that a well-validated *CI* prediction framework that is of direct relevance to the cognitive-behaviours of interest to this study do not exist, the researcher made the assumptions that all theories published in the peer-reviewed journals are, in general, ethical and of good value, unless contradicted by the literature. The constructions of the research questions will be primarily tied to the prior research findings as well as the research gaps found within the relevant bodies of knowledge to date. Therefore, research questions constructed are assumed to be ethical and credible. More detailed discussion on this assumption will be presented in Chapter 3.

- While the nature of ALPs slants towards ideation, the actions carried out by the ALP team members, and the exchange amongst them during the sense-making and problem-solving processes represent a fair inference on the level of the *CI* in the teams.

- As the questionnaires are administrated at the same phase of the ALP journey for all participants involved and the guiding principles for the ALP do not drastically differ between programmes, all participants are subjected to similar factors that resembles the business settings when furthering their ALP business concepts.

- The panel of judges will conduct their role professionally and keep each other in check to reduce the level of individual biases in the adjudication process.

1.8 Structure of the thesis

Chapter 1 outlines the introduction and provides a high-level overview of this study. The chapter expresses the problem statements and identifies the knowledge gaps which this study will be addressing. It deliberates the purpose of the study and the scope of investigations. The chapter also presents the delimitations and assumptions.

Chapter 2 provides a comprehensive literature review on the *CI* studies to date. The theoretical foundations that underpin the twenty hypotheses of the three cognitive-behavioural clusters to be subjected to evaluation will be included. Moreover, this chapter also presents the preliminary theoretical frameworks to be subjected to empirical validation.

Chapter 3 explains the relevant foundations for research philosophy and methodology adopted in this study. The chapter will specify ontology, epistemology and axiology chosen by the researcher, followed by the discussion on research design, target population, sampling tactics, development of research instruments and data collection approaches. The ethical considerations will also be discussed in this chapter. Thereafter, detail on techniques deployed in this study will be articulated succinctly.

Chapter 4 will provide the outputs of research analyses and highlight the key findings in relations to the problem statements and the purposes of this study.

Chapter 5 shall discuss and interpret the key observations made from the findings according to the hypotheses. It will also provide concise arguments that link back to the problem statements.

Finally, **Chapter 6** draws conclusions based on the problem statements and the four objectives highlighted as the purpose of the research. Additionally, limitations and recommendations for future research will be presented.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The purpose of this literature review chapter is to identify, evaluate, define and discuss the key theories, concepts, models, findings and research trends of importance to the problem statements and the purpose of this study as stipulated in Chapter 1. As collective intelligence (*CI*) is a multidisciplinary topic, the chapter shall begin by categorising the broader *CI* body of knowledge into three major themes of *CI* research and deliberate the foundation perspectives from these themes. It will then focus on the specific theme that is of interest to this study and present some of the recent studies that support the existence of *CI*. Subsequently, the chapter will discuss the contrary views which dispute the existence of *CI*. The research gaps and shortcomings of *CI* related studies will also be discussed. Thereafter, the chapter will examine the notable definitions and explanations proposed by the scholars to date with the intention to synthesise a working definition for the purpose of this study. The process of synthesising a working definition further demonstrates that a novel framework for predicting *CI* should incorporate three particular clusters of cognitive–behaviours. The remaining sections of this chapter will provide the relevant literature that deliberates why it is noteworthy to incorporate selected cognitive–behaviours as the hypotheses for each of the clusters. Finally, the chapter will present the preliminary theoretical framework that is based on these clusters and hypotheses before offering the chapter conclusion.

The flow and the key components of Chapter 2 can be viewed in Figure 2.1 on the next page.

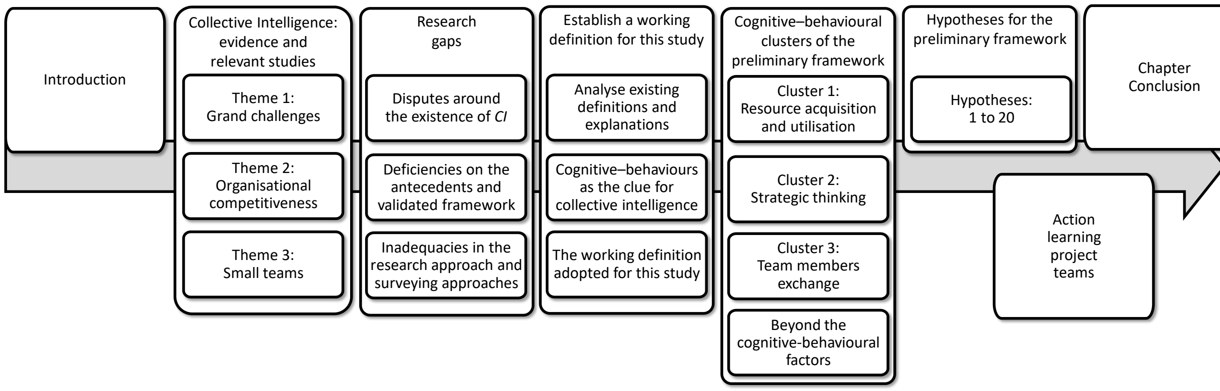

Figure 2.1 The flow and the key components of Chapter 2 (author's own)

2.2 Collective Intelligence: Evidence and relevant studies

Throughout the ages, the ability for various species to intentionally band as small groups in an effort to build intelligence for the purpose of enhancing their abilities, speed, performance and competitiveness has continued to fascinate and captivate researchers (Couzin, 2009; Mulgan, 2018; Peters & Heraud, 2015; Ioannou, 2017; Krause, Ruxton & Krause, 2010; Levy, 2015; Secundo, Lombardi & Dumay, 2018). For humans throughout the centuries, the significance of *CI* is particularly accentuated when individuals work collaboratively to deal with adversarial circumstances (Woolley, 2011) and mitigate the challenges contextually in a just-in-time fashion (Glenn, 2015). While concepts similar to *CI* can be dated back to Aristotle (Landemore, 2017), in the modern days, the construct of *CI* loosely infers to the ability for the groups or teams to sense the challenge, gather resources (Elia & Margherita, 2018) and generate creative concepts collectively to maximise the success of their endeavours (Flores et al., 2015). When it comes to business research, despite *CI* related studies covering a broad spectrum of other topics, inter alia, top management teams (Floyd & Wooldridge, 1992), family businesses (Rondi, De Massis & Kotlar, 2018), virtual teams (Barlow & Dennis, 2016), creativity {Choi, 2018 #598), innovation (Lee

& Jin, 2019), community of practice (Mačiulienė & Skaržauskienė, 2016), consumer behaviours (Carter & Yeo, 2018), crowdsourcing (Täuscher, 2017; Vercammen et al., 2019), informal groups (Woolley, Aggarwal & Malone, 2015), knowledge management (Boder, 2006b), project management (Hansen & Vaagen, 2016), big data (Jung, 2017) and technology-enhanced competitiveness (Barlow & Dennis, 2016), the empirical studies remain limited (Kaur & Shah, 2018).

The study of *CI* can be broadly speaking classified into three interrelated themes; 1) grand challenges, 2) organisational modus operandi and 3) small teams. Brief explanations for each theme will be elaborated below.

2.2.1 Theme 1: Grand challenges

Within the theme of grand challenges, the theories and applications for *CI* concentrate on how the wisdom of the crowd can be mobilised to solve pertinent humanity and national issues or, at the very least, hurdles beyond the boundary of organisational context (Lorenz, Rauhut, Schweitzer & Helbing, 2011; Salminen, 2012; Surowiecki, 2005). In this theme, studies such as harnessing ecosystems (Elia, Margherita & Passiante, 2020), mitigating wicked problems (Elia & Margherita, 2018) and building democracy (Helbing & Pournaras, 2015; Landemore, 2012) can be found readily. Other topical research agendas also include multi-stakeholder scenario crowdsourcing (Surowiecki, 2005; Yu et al., 2018), forecasting (Croce, Wöber & Kester, 2016), coordinated masses for decision-making and actions (Bonabeau & Meyer, 2001); technology-mediated social participation (Preece & Shneiderman, 2009), swarm intelligence (Befort, Baltaxe, Proffitt & Durbin, 2018; Metcalf, Askay & Rosenberg, 2019, hybrid intelligence or computer-aided intelligence (Dellermann, Ebel, Söllner & Leimeister, 2019), open innovation (Lee, Min & Lee, 2016), grand-scale social projects (Tapscott & Williams, 2006), intellectual property (Secundo, Dumay, Schiuma & Passiante, 2016) as well as control, governance and policing (Leimeister, 2010).

With the advancement of technology and change of societal trends in the era of the 4^{th} Industrial Revolution, new *CI* research topics at the grand challenges level are beginning to emerge, and there are still many research questions waiting to be explored (Glenn, 2015). For example, how some ideas gain traction in crowds while others do not, may have nothing to do with the quality of the ideas considering that the best collective decisions are "not made by consensus building and compromises, but through a competition of heterogeneous independent opinions, i.e. through the usage of collective" (Leimeister, 2010 p. 245). Some of the other intriguing research questions for future CI studies include the extent of and the interplay between competition, coopetition and collaboration among the cohorts, groups, syndicates or teams (Renard, Zhao, Balagué & Elmoukhliss, 2016).

Nevertheless, from the perspective of this study, the researcher would like to argue that in order to understand various determinants that affect the progress of *CI* building at the grand challenge level, it is beneficial for researchers to unravel the intricacies on how small teams can build *CI* and thereafter explore the possibility of extrapolating some of the findings to study how large groups can build and sustain this complex phenomenon.

2.2.2 Theme 2: Organisational modus operandi

In the second theme, *CI* studies within the context of organisational modus operandi pay a keen interest on the processes, practices and dynamics that enable organisations to harness and harvest ideas from the employees and external stakeholders (Gréselle-Zaïbet, 2019; Chesbrough & Appleyard, 2007; Salvato & Rerup, 2011; Scarlat & Maries, 2009; Woolley & Fuchs, 2011). The studies of CI at this level have been directly or indirectly linked with a wide range of industry sectors, such as tourism (Croce et al., 2016), hospitality (Zopiatis & Theocharous, 2018), healthcare (Mao & Woolley, 2016; Nguyen et al., 2019), education (Gregg, 2009), politics (Landemore, 2012) and the likes.

Publications that fall within this theme aim to formulate new theories or apply existing insights to the association between *CI* and work process, operations, service and business models (Lee & Jin, 2019; Täuscher, 2017). For instance, when the leaders of Qualcomm, an American Semiconductor company, decided to leverage their employees' creative thinking, there were more than 1,100 participants in the activity. Subsequently, this effort to harness corporate entrepreneurship through *CI* resulted in the submission of 730 new business ideas, some of which were implemented and transpired to over $300 million value for the company (dos Santos & Spann, 2011). Other similar studies on how organisations gather intelligence using public and private open-innovation interventions to boost their corporate entrepreneurship and innovation can also be found (Alkema et al., 2017; dos Santos & Spann, 2011; Kratzer, Meissner & Roud, 2017; Svahn et al., 2017, Whelan, 2011 #233; Yun et al., 2019). However, the linkage between the research questions of these studies and *CI* could be a lot more explicit.

Other investigations on how *CI* affects or can be affected by a wide range of factors are beginning to emerge, and these factors include, *inter alias*, interaction between human and non-human actors (Kietzmann, 2017), strategic partnership (Eisenmann, Parker & Van Alstyne, 2006), risks (Wilson, Robson & Botha, 2017), customer or stakeholders co-creation (Kazadi, Lievens & Mahr, 2016; Lee, Olson & Trimi, 2012), organisational structure (Chmait, Dowe, Li, Green & Insa-Cabrera, 2016), learning (Pedler & Burgoyne, 2017), innovation space (Morel et al., 2018), knowledge management (Boder, 2006a; Secundo et al., 2016), corporate entrepreneurship (Franco & Haase, 2017; Martín-Rojas, Fernández-Pérez & García-Sánchez, 2017) and leadership (Friedrich et al., 2016; Friedrich, Vessey, Schuelke, Ruark & Mumford, 2009; Matzler, Strobl & Bailom, 2016).

Despite that the studies at this theme are gaining popularity, the empirical studies dedicated to demonstrating the existence and antecedent of *CI* require more effort from the research communities (Kaur & Shah, 2018; Mayo & Woolley, 2017). Furthermore, according to Chmait et al. (2016), *CI* within the organisations is attributed to the factors within business environments (complexity and uncertainty), styles of cooperation (communication protocol, interaction time between the members and number of members within the group/team) and characteristics of individual members involved (individual intelligence and speed). Based on these descriptions, it is apparent that while on the one hand, *CI* studies within the themes of organisational modus operandi and grand challenges are interrelated, but on the other hand, the importance of understanding the next theme, i.e. small teams, also comes into play.

2.2.3 Theme 3: Small teams

The third theme of *CI* studies involves the effort, dynamics and outcome of a small team of collaborators – which is the central area of interest of this study.

A small team can be regarded as a formalised unit or informal gathering of a group of people who share some commonality. Previously, the intelligence quotient of a team or group was typically evaluated as the average intelligence of all the members comprising the team or group. While some researchers also made a commendable effort to evaluate the intelligence at the team or group level, both approaches did not lead to meaningful outcomes (Devine & Philips, 2001).

From the research theme of small teams, apart from some of the research agendas which already stated in the research themes previously mentioned, *CI* studies tend to gravitate towards the conditions and human factors that can enhance the effectiveness of problem-solving and decision-making effectiveness of the teams (Akgün, Dayan & Di Benedetto, 2008; Friedrich et al., 2016; Kolonin, Vityaev & Orlov, 2016; Kozlowski & Chao, 2018). For example: Hernández-Chan et al. (2016) were able to demonstrate that when physicians applied a process to build intelligence collaboratively, it increased the consensus of physicians, which subsequently led to more knowledge acquisition and time-saving. Kämmer et al. (2017) support this sentiment and show that when 285 medical students diagnosed 1,710 computer-simulated cases independently, the result was 22 per cent less accurate than the instances when they were able to discuss five other independent decisions before submitting their verdicts. Other studies that support the existence of *CI* in small teams can also be found (Jean, Perroux, Pepin & Duhoux, 2019; Mao & Woolley, 2016; Moser, Dawson & West, 2019).

There are additional traceable studies on how *CI* impacts judgement and decision-making in management research disciplines. (Davis-Stober et al., 2014) used an empirical study to demonstrate that the quality of individual judgment improved when these individuals were able to collect divergent opinions among themselves. Whereas another study conducted by Rosenberg et al. (2018) found that the average social intelligence significantly increased when individuals work together in comparison to when they are working in isolation, a discovery that was made after the evaluation of 61 small groups of individuals comprising between 3 to 6 members per group. Other noteworthy topics such as knowledge sharing and learning (Aggarwal, Woolley, Chabris & Malone, 2019; Huang & Chin, 2018; Runsten, 2017; Van Der Vegt & Bunderson, 2005), coordination of effort (Kittur, Lee & Kraut, 2009), agility (Diegmann & Rosenkranz, 2016; Gréselle-Zaïbet, 2019), diversity (Díaz-García, González-Moreno & Jose Saez-Martinez, 2013), individual skills set (Huang & Chin, 2018), and team science (Runsten, 2017), are some of the on-going themes that intrigue the research communities.

One of the most notable research articles on *CI* was published by Wooley et al. (2010) in a highly cited scientific journal, *Science* (Journal Impact, 2018 = 41.06 (Scimagojr, 2020)). After having carried out a series of experiments that requested 200 groups of participants to solve a range of various tasks, the researchers observed a high likelihood that a team which did well in one task would also accomplish other similar tasks in a relatively satisfactory manner (Woolley et al., 2010). The researchers further attributed this repeated praiseworthy performance of these particular groups to the presence of *CI* and suggested that one can predict the future performance of such groups based on the past performance of similar tasks.

Woolley and Fuchs (2011) further added that *CI* can be affected by two interrelated processes, divergent thinking as the result of independent perspectives within the team and convergent thinking when team members consider the collective action to be taken as the way forward. The combination of both convergent and divergent processes can enhance the magnitude of the *CI* of the team (Woolley & Fuchs, 2011). Extending from their own series of studies, Woolley and collaborators further concluded that cognitive diversity positively contributes towards *CI* (Woolley et al., 2015) whereas prior experience in working together as a team does not affect the overall *CI* (Engel et al., 2015; Kim et al., 2015).

Despite the increase in popularity on investigating *CI* within the research theme of small teams in recent years, the development of *CI* as a body of knowledge still requires significant effort (Kaur & Shah, 2018; Leimeister, 2010; McHugh et al., 2016; Nguyen et al., 2019; Woolley et al., 2018). Not only that scant empirical studies exist that aim at uncovering the antecedents for *CI* within the research theme of the small teams, conflicting findings can also be found within the literature (Aggarwal & Woolley, 2018; Choudhury & Haas, 2018; Credé & Howardson, 2017; Grimon et al., 2017; Kaur & Shah, 2018; Woolley & Fuchs, 2011; Yu et al., 2018). In particular, despite that notable *CI* studies to date within this research theme uncovered serval intriguing findings, the majority of them did not take on a holistic approach of integrating cognition, behavioural and socialisation aspects as the means to investigate the antecedents of *CI* (Paletz & Schunn, 2010). Owing to these research gaps, scholars are urging for more comprehensive investigations from the research communities (Aggarwal & Woolley, 2018; Canonico, Flathmann & McNeese, 2019; Kaur & Shah, 2018; Mello & Rentsch, 2015; Paletz & Schunn, 2010; E. R. Smith, 2008; Woolley et al., 2018).

To sum up this section, despite that *CI* has recently gained growing popularity in different research communities, our understanding towards this construct remains scares (Kaur & Shah, 2018; Salminen, 2012; Yu et al., 2018). Within the research theme of the small teams, which is the main focus of this study, literature has yet to offer a conclusive theory that explicates why some groups are more 'intelligent' than others (Hansen & Vaagen, 2016). The research gaps, conflicting views and shortcomings of the *CI* studies to date serve as the opportunity that invites for holistic research to probe into key cognitive–behavioural factors that may strengthen the quality of *CI* (Bates & Gupta, 2017; Credé & Howardson, 2017; Engel et al., 2015; Kaur & Shah, 2018; Reiter-Palmon & Leone, 2019; Woolley et al., 2018; Yu et al., 2018). Section 2.2 will attempt to categorise the conflicting views and shortcomings exist in the body of knowledge of *CI* of small teams (Section 2.2.1 to 2.2.3).

2.3 Collective intelligence: Research gaps

A literature review will not be complete without highlighting the research gaps. Conflicting views between the studies exist in the *CI* body of knowledge. Inadequacies of the investigations and controversies on the surveying methods further serve as additional reasons that compel the need for this study. This section will review the existing literature and succinctly deliberate the research gaps of *CI* after having categorised them into the following categories:

- Disputes around the existence of *CI*
- Deficiencies on validated antecedents and frameworks
- Inadequacies in research approaches and surveying methods

2.3.1 Disputes around the existence of collective intelligence

Despite that Section 2.1 outlined several examples that advocate the existence as well as the benefits of *CI* in management science, conflicting views exist within the research communities. For example, after conducted three experiments with 312 participants, Bates and Gupta (Bates & Gupta, 2017) asserted a contrary view. They stated that 80% of *CI* differences between groups is directly associated with the differences in the IQ levels of the team members of different teams. Credé and Howardson (2017) also opposed the claims made by Woolley et al. (2010) and demonstrated that there is a lack of consistency when attempting to account the variance in the performance of many groups to a general factor such as *CI*. In addition, Reiter-Palmon and Leone (2019) reveal that despite some research asserting that when managed, a team of individuals tends to outperform the average (and frequently the best) individual in various types of tasks, viz, sense-making, ideation, creativity, and problem-solving (Hanea et al., 2018; Lyle, 2008; Tetlock et al., 2014; Woolley et al., 2015), teams may not necessarily perform better than individuals. Balijepally et al. (2009) also advocate that the "assembly bonus effect", in other words, an increase in the performance of the collaborators due to the partnership among them members, does not exist when the study compared the quality of the software programmes produced by one programmer against the ones produced by a pair of programmers.

These conflicting views offer an opportunity for more researchers to validate and explore the relationship between the intelligence of the collective and the intelligence of individuals.

2.3.2 Deficiencies on the antecedents and validated frameworks

Various studies have continued to improve our understanding of the underlying factors for *CI*. For example, Woolley and her collaborators (Woolley et al., 2010; Engel, Woolley, Jing, Chabris

& Malone, 2014) have strongly asserted that *CI* does not correlate strongly with the average or maximum intelligence of each team member. Instead, it is correlated on the following; the general social sensitivity of each individual group member, the shared leadership for conversational turn-taking, and the percentage of females in the group – which the authors contribute as the level of empathy within the group. Other researchers have also shown that having gender diversity (Lee, Choi & Kim, 2018) and female leaders (Post, 2015) positively reduce conflict and enhance cohesion within teams – which were posited to have an indirect effect on creativity and innovativeness. However, the association between the increased *CI* in proportion to the number of women in the group and the tendency of conversation turn-taking have been disputed (Bates & Gupta, 2017). Similarly, other scholars have suggested that the relationship between gender, types of diversity and team innovation is far from being straight forward (Dayan, Ozer & Almazrouei, 2017; Wikhamn & Wikhamn, 2019).

For this literature review chapter, the author has invested a considerable amount of effort to uncover the existing frameworks of *CI* for small teams. The outcome of this pursuit concurred with various studies which suggested that limited theoretical models for *CI* exist to date, and there is a lack of a holistic framework or an empirically validated psychological assessment instrument when it comes to building *CI* at the level of the small teams (Kaur & Shah, 2018; Salminen, 2012; Suran et al., 2020; Yu et al., 2018). Therefore, this is one of the areas that awaits more notable contributions from scholars. But the author managed to find selected frameworks of relevance and these frameworks, as well as their shortcomings, are discussed below.

A literature review of *CI* models and frameworks was conducted by Suran, Pattanaik and Dirk (2020). The researchers claimed to have identified 9,418 scholarly articles from *CI* and other relevant fields published since 2000 and aggregated their findings into one generic framework of *CI* systems. This framework categorised a wide range of antecedents into “Who” (staffing), “How” (process), “What” (goals) and “Why” (motivation) components. However, instead of being a theoretical model, this framework is too high-level and conceptual. Moreover, due to the fact that it is an aggregation of other research findings, it lacks the empirical validation, and specificity for the use of increasing the *CI* at the level of small teams. The classification of the scholarly articles found by the researchers also did not take the cognitive–behavioural aspects into consideration.

In an article titled, “A scoping review provided a framework for new ways of doing research through mobilizing collective intelligence” published in Journal of Clinical Epidemiology (impact factor 2018 = 4.650 (JCE, 2020)), the co-authors provide a robust framework that is more aligned with the category of “grand challenge” level of the *CI* body of knowledge. It is believed that with minor modifications, the framework can also be used to increase the competitiveness of the organisations (Nguyen et al., 2019). However, not only is this framework a conceptual one, it does not focus on building *CI* at the level of small teams once again. Similarly, Elia and Margherita (2018) provide a *CI* conceptual framework to solve wicked problems also aimed at the levels higher than the level for small teams.

Salminen and Harmaakorpi (2012) investigate the possibilities of building a *CI* framework by comparing the collaborators as the nest-site selection process of honeybees. The prototype model was tested in a case organisation, and the preliminary result was reported to be promising. But it is worth-noting that only 29 employees participated in the trial run, and the quantitative validation was carried out to 74 ideas. Moreover, the “framework” outlined was more like a set of principles rather than being established as a theoretical model.

Unlike the above-stated study, which involved too few participants, Lee and Jin (2019) sampled 1500 employees in an attempt to build a *CI* theoretical framework. Their study uncovered that *CI* affects work process, operations, and service innovation. However, the proposed framework is restricted to how two motivational factors (the desire of personal and social contributions) may affect the overall *CI* and the mediating effect of three specific cognitive–behaviours (participating, sharing and co-creating). The thinking component for small teams is missing from this framework.

Equally, while the *CI* framework proposed by Jean, Perroux, Pepin and Duhoux (2019) may have proposed various valuable antecedents from both the collective dimension (sharing, co-constructing and conflict resolution) and learning dimension (mutual learning, reflective observation, active experimenting and boundary-crossing), the thinking element is lacking once again.

Contrasting to the previous studies, Canonico, Flathmann and McNeese (2019) offer discussions on a potential conceptual framework by attributing *CI* as the outcome of team cognition and artificial intelligence. While the article discussed how to use artificial intelligence to enhance the team problem-solving process, the team cognition aspect is not comprehensive. Neither have the proposed concepts been subjected to empirical validation and therefore present another gap in the research.

One of the more comprehensive frameworks is the one proposed by Kaur and Shah (2018), albeit in a lower impact factor journal (The impact factor of Journal of Human Behavior in the Social Environment in 2018 is 0.808 (Scimagojr, 2020)). According to Kaur and Shah (2018), a mixture of underlying factors affecting the *CI* have been proposed, and they can be roughly sorted into three sets of clusters, namely, Effective Group, Mass Collaboration and Collective Intelligence Approaches. Surowiecki (2005) accentuated the importance of Effective Group premise by proposing the main four factors for *CI* as 1) diversity, 2) decentralisation, 3) independence and 4) information aggregation. Whereas, the Mass Collaboration tenet, advocated by Tapscott and Williams (2006) proposes 1) openness, 2) peering, 3) sharing and 4) acting globally as four of the key factors affecting *CI*. Lesser, Ransom, Shah and Pulver (2012) attributed Collective Intelligence Approaches to these three factors 1) discover and share new ideas, 2) augment skills and distribute workload, and 3) improve forecasting effectiveness as the main intergradient to harness *CI*. Modified from these three sets of recommendations, Kaur and Shah (2018) developed a *CI* scale, which consisted of 1) coordination, 2) networking, 3) independence, and 4) diversity as the main factors. However, the processes of deriving all these findings are not without their own shortcomings, the most critical being the fact that none of these four studies consist of a set of measurable dependent variables. Instead, these factors were derived based on the perceptions of the participants.

Overall, all of these frameworks presented are either unsuitable for the use of predicting the *CI* of small teams or lack the empirical evidence of casual relations.

2.3.3 Inadequacies in the research approach and surveying approaches

The research methodologies of investigating *CI* and disciplines of relevance to *CI* also vary drastically from the purely theoretic and conceptual (Kaur & Shah 2018; Luo et al. 2009; Surowiecki, 2005; Szuba 1998; 2002; Tapscott & Williams, 2008), simulations and experiments (Bosse et al. 2006; Kim et al., 2017; Pérez et al., 2016; Mao & Woolley, 2016; Woolley et al. 2010; 2015) to real-life cases and systems design (dos Santos & Spann, 2011; Feldmann et al., 2019; Gruber 2007; Vanderhaeghen & Vettke 2010).

It is important to highlight that the context of many *CI* studies presented in the previous sections deviates significantly from the context of management science. For example, the studies conducted by Woolley and colleagues typically consist of the experiments performed within a laboratory setting using rudimentary tasks or computer games (Woolley et al., 2010; 2015; Aggarwal & Woolley, 2014; Engel et al., 2015; Kim et al., 2015). Frameworks proposed by Surowiecki (2005), Tapscott and Williams (2006), Shah and Pulver (2012) as well as Kaur and Shah (2018) were evaluated according to participants' perceptions instead of being validated against a set of tangible business innovation outcomes. The challenges which teams or groups typically encounter within the business context are significantly more complex than the research conditions of *CI* studies proposed by the scholars. Therefore, it may not be suitable to extrapolate the findings from the non-business-related studies to predict the *CI* of the team within the context of management science.

Additionally, the way in which the participants are generally surveyed for the *CI* and relevant studies is typically through a self-reporting method, and this surveying method is a noteworthy point of contention. A self-report study, also known as self-processing, self-reference or self-evaluation, is the surveying approach that requires participants to go through questionnaires or polls, impose self-judgement to their relevant circumstances and select a response by themselves without interference (Jupp, 2006). It is one of the popular surveying techniques adopted frequently by researchers in management science. However, various studies have highlighted the biases and errors owing to the self-reporting surveying methods (Auer & Griffiths, 2017; Cunningham & Turk, 2017; Fisher, 1993; Roberts, 1995; Rowland, 1990; Symons & Johnson, 1997).

Socio-psychology studies dating back to the 1970s have suggested that, overall, individuals' judgments on their behaviours differ from how they judge others (Adams-Webber & Davidson, 1979). Self-judgement tends to be more situational, less consistent and accurate than when individuals judge the behaviours of others (Jones et al., 1971; Lay et al., 1974). It leads to self-reporting bias (Arnold & Feldman, 1981; Hill & Roberts, 1998; Spector, 1987). Management science researchers have stated that self-report research methods can threaten the validity of business research and hamper the development of organisational behaviour body of knowledge (Donaldson & Grant-Vallone, 2002; Van de Mortel, 2008). These topics continue to fascinate scholars, exemplified by the special issue of the June 2017 Quarterly Journal of Experimental Psychology, which calls for more studies to examine this topic (Cunningham & Turk, 2017).

Unfortunately, a majority of the *CI* investigations and experiments leverage a self-reporting format. There is a lack of empirical investigations comparing the findings from the self-reporting method of how individuals rank their own behaviours within the teams (in the context of this research, termed “Rate Self” surveying approach) against the findings from collective scores of how individuals within their teams see the general behaviours of the team as an entity (termed “Rate Team” surveying approach). Which surveying approach will be deemed a better method to study the predictors of *CI* remains to be clarified. This research will aim to address this research gap.

2.4 Establishing a working definition for this study

It is always important to define the core construct of interest for any scientific study. This is because having established a definition enables all stakeholders to hold a common understanding of the subject of interest. Subsequently, all parties can make use of this common ground as the point of departure for the purpose of furthering and strengthening the depth of discussions (Saunders et al., 2012).

The aim of Section 2.4 is to formulate a working definition for *CI* for the context of this study. Firstly, Section 2.4.1 shall analyse then categorise the existing definitions and explanations in ways that align with the purpose of this study. Then Section 2.4.2 will argue why the term “cognitive–behaviours” must be included in the work definition as well. Subsequently, Section 2.4.3 will offer a working definition for this study combining the key constructs uncovered in Sections 2.4.1 and 2.4.2.

2.4.1 Analyse existing definitions and explanations

The concept of *CI* is not a novelty. It can even be traced back to ancient eras (Landemore, 2017; Waldron, 1995) and various definitions for *CI* exist up until now. Etymologically speaking, the term “collective intelligence” (*CI*) is made up of the words “collective” and “intelligence”. The word “collective” describes a team of individuals who are not compelled to exhibit the same outlook or behaviours but decide to establish some form of shared vision or similar characteristics (Leimeister, 2010). Whereas the term “intelligence” generally infers to the ability of a creature to acquire and apply knowledge and skills to solve challenges (Ackerman, 2017). However, defining *intelligence* for individuals remains as a controversial topic for more than a century (Ackerman, 2017; López-Robles et al., 2019), which makes the pursuit of offering a universal definition of *CI* even more challenging. Therefore, instead of offering a universal definition, this study aims to examine the definitions and explanations offered by scholars to date before synthesising a working definition suitable for the context of this study.

The remaining parts of this section will first highlight the commonalities among key definitions. Thereafter, for the purpose of strengthening the arguments of this study, the section will highlight three subtle but profound variations of *CI* definitions categories. Discussions on how each category relate to this study and how they provoke the development, and the conceptual framework of this study will also be offered. Thereafter, this section will express how the researcher synthesised the working definition of *CI* for the purpose of this study.

2.4.1.1 Commonalities

In the early years, scholars had discussed notions similar to *CI*, and they broadly described such phenomenon as the ability of individuals to act purposefully and think rationally when solving hard problems as a collective (Minsky, 1985; Wechsler, 1958). While many thought-leaders have contributed towards the development of this concept, it is widely accepted that Pierre Lévy is the first scholar who coined the term “collective intelligence” in his 1994 book titled ‘*L'intelligence collective*: *Pour une anthropologie du cyberspace* (Collective Intelligence: Mankind's Emerging World in Cyberspace)’. In this book, Lévy defines *CI* as a form of universally *distributed* and *coordinated* intelligence that enables mutual recognition and enrichment of individuals which leads to the effective *mobilisation* of skills (Lévy & Bononno, 1997). In a similar light, Heylighen (2013) concurs with these sentiments, and adds that *CI* can be considered as the capability of a group of individuals to achieve the desired objectives in a complex situation or to unite to solve various problems through collaborative effort rather than on individual basis. Notions that attribute *CI* as the pheromone of achieving common objectives through a well-coordinated effort among the collaborators for mutual enrichment can be found embedded in a majority of the *CI* definitions. The essential ethos emphasised made by scholars in this category include “collective”, “together”, “collaboration”, “coordination”, “mutual benefits”, “common objective”, and the likes.

2.4.1.2 Category 1: Resourcing related ethos

This category of definitions explicitly includes some form of resource gathering and leveraging behaviours. Taking the same above-stated definition provided by Lévy, the term “mobilisation of skills’ implies that important resources such as skills have to be harvested and applied. Similarly, the definition provided by Zara (2008) also proposes that *CI* is the capacity of how individuals can effectively *combine* intelligence and knowledge to achieve a common goal. A comprehensive review of team intelligence authored by Runsten (2017) also extensively elaborates on the central role of resource in acquisition in support of strengthening the intelligence within the team. Additionally, taking from the information communication technology and computer science as the reference point, Malone and Klein (2007) define *CI* as the synergistic and *cumulative channelling* of the vast human and technical *resources* currently available. Despite that the medium may be technology-based, this definition continues to emphasise the action of combining resource in a coordinated effort. Other researchers have also added similar interpretations of the importance of resource gathering and leveraging (Glenn, 2014, 2015; Kapetanios, 2008).

The resource acquisition and leveraging aspects highlighted by the above definitions and explanations provide a helpful provocation to the conceptualisation phase of this study. These important aspects will be incorporated as a component of the preliminary framework. More information on this topic will be discussed in Section 2.5.1.

2.4.1.3 Category 2: Thinking related ethos

Some scholars have advocated that it is too simplistic to merely attribute *CI* as the practice of embracing a communal ethos to gather resources to achieve a common goal for a mutually gratifying experience. For example, Pór (1995) introduces the thinking element and defines *CI* as a phenomenon that permits human communities to evolve towards higher order complexity and harmony. Sternberg (2000), a prominent thought-leader in human intelligence who was among the first to embrace a more holistic cognitive outlook to describe intelligence, defines *CI* as the collective thinking ability of individuals to solve challenges, problems or to create products that are valued by the individuals. His definition is heavily influenced by his Triarchic Theory of Intelligence that stipulates that the underlying components of intelligence are based on analytical, creative and contextual thinking (Sternberg, 1984). Similarly, Yannou et al. (2008) define *CI* as the intelligence that emerges from the synergetic creative efforts amongst individuals when a cognitive task takes place. Whereas Reia, Amado and Fontanari (2019) made the thinking element even more explicit and further theorised that the *CI* is manifested owing to the fact that a team of cooperating agents with common goals can solve problems more efficiently through brainstorming than agents working in isolation.

These definitions and explanations introduced by the above-mentioned scholars prompted the researcher to incorporate the 'thinking' component in the preliminary framework of this study. More information on this topic will be discussed in Section 2.5.2.

2.4.1.4 Category 3: Socialising related ethos

Woolley et al. (2010) have substantiated that *CI* is as the result of group members' sensitivity towards one another, allowing each other to take turns to speak and the proportion of females in the group, which they postulate as empathy levels. This explanation accentuates that *CI* must be an emergent competency that is generated and maintained through social interaction. Team members can adapt to each other's ways of work when attempting to solve diverse challenges. Likewise, Massari, Giannoccaro and Carbone (2019) describe *CI* as the collective ability of human groups in solving different tasks by exploiting the power of social relationships. Other scientists have also concurred the importance of examining the significance of studying the social exchanges within the teams or groups in building intelligence of the collectives (Hill, Brandeau, Truelove & Lineback, 2014; Swaab, Schaerer, Anicich, Ronay & Galinsky, 2014). These definitions and explanations infer that there is a need for a better definition of *CI*, in particular, a definition to incorporate the exchange between the members. To further the argument on the need for a better *CI* definition, one can perhaps refer to the controversial study conducted by Credé and

Howardson (2017). Despite that the researchers questioned the existence of *CI*, they do propose that intelligence of the collective can be dependent on the complex dynamics of the exchange among the collaborators.

It is owing to the importance of social exchange; some scholars explain that the intellect established by the collectives can be regarded as “network intelligence”. They regard *CI* and similar constructs, such as team innovation, as the collectivistic intellect harvested and harnessed from individuals, groups and communities within social networks owing to favourable social exchanges (Brabham, 2010; Coe, Paquet & Roy, 2001; Eden & Chen, 2007; Hill et al., 2014; Lykourentzou, Papadaki, Vergados, Polemi & Loumos, 2010; Pentland, 2007). The emergent, contextual property as an essential pre-requisite characteristic of *CI* was also supported by other similar scholarly explanations (Glenn, 2015; Kapetanios, 2008). To sum up, this category of definitions highlights the contextual nature of *CI* and owing to this nature, its emergence is associated with *exchange* among the members of the small teams.

The ethos of relevance to socialisation and member exchanges highlighted in this section has contributed towards the formulation of the preliminary integrative cognitive–behavioural framework of this study. More information on this topic will be discussed in Section 2.5.1.

2.4.1.5 Summary of key scholarly definitions and explanations

Taking the insights extracted the definitions and explanations documented in Section 2.4.1.1 to 2.4.1.3, it is apparent that in order to create *CI,* one needs individuals to form teams, work together, gather and make use of the appropriate resources, think effectively to solve problems and make decisions, as well as socialise and interact in ways that create helpful dynamics. In summary, this study proposes that the following facets of ethos must be incorporated in the working definition of *CI* for this study, and they are:

1. A working definition must include the wordings that capture the ethos of collectivism, coordinated approach, or exploration of synergies in collaboration to achieve common goals or objectives in a mutually benefiting way.

2. Ethos such as being contextual, acquiring critical resources, exercising helpful thinking styles and upholding beneficial social exchange among the members should also be incorporated.

Table 2.1 provides the definitions and explanations for *CI* from 55 articles of relevance to the *CI* research theme of small teams in a chronological order. The table further analyses these insights offered by these scholars and sorts them according to the different categories of ethos uncovered in the previous sections (Categories 1, 2 and 3 = Sections 2.4.1.2 (resourcing), 2.4.1.3 (thinking) to 2.4.1.4 (socialising)). The total amount of citation for each article is also documented.

Table 2.1 Definitions and explanations for collective intelligence

	Studies (Chorological order)	**Definitions and explanations**	**Categories**			**Citation**
			1	**2**	**3**	
1	Wechsler (1958)	Individual's capability to act purposefully and think rationally as a collective but it is more than the result of only the collective behaviour.		✓		4042
2	Kahneman & Varey (1990)	Individuals possess diverse knowledge, competency and thinking abilities. When combining these differences together, it can create a larger pool of resources to mitigate challenges more effectively.	✓			296
3	Gardner (1993)	Acquiring resources to solve problems or to create products that are valued within one or more cultural settings.	✓			39048
4	Pór (1995)	The capacity of a community to evolve towards higher order complexity thought, problem solving and integration through collaboration and innovation.		✓	✓	85

5	Lévy & Bononno (1997)	A form of universally distributed and coordinated intelligence that enables mutual recognition and enrichment of individuals which leads to the effective mobilisation of skills.	√	√		3171
6	Heylighen (1999)	The ability of a group to solve different problems collectively rather than on the individual basis. *CI* can be strengthened by using collective mental map to reduce individual cognitive limits and better coordination between members.		√	√	345
7	Boder (2006)	*CI* is as the result of knowledge management.	√			122
8	Goyal & Akhilesh (2007)	*CI* is as the result of these interdependent factors, innovativeness, cognitive intelligence, emotional intelligence and social capital of work teams.		√	√	105
9	Malone & Klein (2007)	It is the result of a synergistic and cumulative channelling of a variety of available human and technical resources.	√		√	150
10	Kapetanios (2008)	*CI* is created as machines enable the harvesting of large amounts of existing knowledge and new knowledge in collaboration with human.	√			68
11	Yannou et al. (2008)	A property which emerges from the synergy of individual creative and collaborative efforts when a cognitive task takes place.		√	√	50
12	Zara (2008)	The ability to combine intelligence and knowledge to achieve a common objective.	√			107
13	Gregg (2009)	The capacity to share knowledge, solve problem and make decisions as the result of the interaction and collaboration within groups in order	√	√	√	24
14	Leimeister (2010)	Modified from Wechsler's (1964) definition and describe *CI* as the ability to act purposeful, think reasonably, and to effectively deal with its environment.	√	√		214
15	Malone et al. (2010)	Large, loosely organised people can work together in various surprising ways to produce intelligent answers through harvesting collections of knowledge.	√			630
16	Schut (2010)	*CI* is complex but allows the systems to adapt effectively in uncertain and unknown environments and organise themselves autonomously, through emergent behaviours.		√	√	113
17	Paletz & Schunn (2010)	*CI* is the combination of socialisation and cognition.		√	√	121
18	Woolley et al. (2010)	The group or team's general capability to perform a wide variety of tasks in part attributed to the sensitivity of members towards one another.			√	1909
19	Lorenz et al. (2011).	The level of CI in groups and social groups are affected by social influence			√	886
20	Lykourentzou, et al. (2011)	An emerging research field that seeks to merge human and machine intelligence, with an aim to achieve results unattainable by either one of these entities alone.	√			48
21	Quinn & Bederson (2011)	The outcome as the result of inherent decision-making abilities of large groups.		√		952
22	Lesser et al. (2012)	*CI* is as the result of the following factors: "discover and share new ideas", "augment skills" and "distribute workload", and "forecasting effectiveness". *But which thinking style to deployed is not implicitly stated.	√	√*	√	21

23	Salminen & Harmaakorpi (2012)	*CI* is as the result of gathering knowledge and evaluating ideas. However, the thinking aspects are not explicitly discussed.	✓			13
24	Chen & Lin (2013)	The author posit that *CI* is as the result of knowledge sharing, cognitive-behaviours without explicitly identify the factors.	✓	✓	✓*	101
25	Heylighen (2013)	How a dispersed group of collaborators with diverse expertise aggregate knowledge and skills to achieve goals in a complex context.	✓			101
26	Pérez-Gallardo et al. (2013)	An active field of investigation that focuses on leveraging the knowledge of human collectives in order to create, to innovate and to invent offerings.	✓			14
27	Engel et al. (2014)	The level of *CI* of the small group is influenced by team members' ability to reason with each other, in other words, both thinking and socialising aspects.		✓	✓	182
28	Hill et al. (2014)	Highlighted culture, collective capability and leadership as the three main components for fostering innovative ideas collectively.		✓	✓	222
29	Surowiecki (2005)	Posit the *CI* is influenced by the Effective Groups Factors which comprise of diversity, decentralisation, independence and information aggregation.	✓			16
30	Engel, et al. 2015)	Various aspects were tested. But the co-authors attribute the level of CI is correlated with the communication (ie, how team members socialise with each other).				42
31	Flores, Negny, Belaud & Le Lann (2015)	To foster *CI*, the members must overcome different hurdles such as "social interaction" and "knowledge management". Members must also define an innovation process for problem resolution.	✓		✓	16
32	Kim et al. (2015)	Teams' general social perceptiveness as an effective predictor of *CI* in small teams.			✓	8
33	Lévy (2015)	A property that emerges in the new algorithmic environment in interaction with personal and critical intelligence.		✓	✓	18
34	Maleszka & Nguyen (2015)	A technique of processing and gathering knowledge from experts and agent systems in collectives to make effective decisions.	✓	✓		43
35	Woolley et al. (2015)	Group interaction (e.g., structures, culture, and proclivity) affects the level of *CI*.			✓	178
36	Barlow & Dennis (2016)	*CI* did not emerge among groups that leverage computer-mediated communication methods and outcome implies that the emergence of *CI* manifests is highly dependent on context of the collaboration.			✓	43
37	Chmait et al. (2016)	*CI* is as the result of cognitive systems of the members in the environment.		✓		36
38	Hansen & Vaagen (2016)	Solving problem effectively owing to the distribution and integration of knowledge among members.	✓			12
39	Hernández-Chan et al. (2016)	Using consensus and knowledge sharing to enhance dynamic collaboration.	✓		✓	14

40	Mao & Woolley (2016)	Inclusive collaboration and open communication play an important role in harnessing *CI*.			✓	42
41	Meslec, Aggarwal & Curseu (2016)	Social sensitivity when team members socialise with each other affect the overall *CI* of the team.			✓	16
42	McHugh et al. (2016)	*CI* is enhanced when positive relationships between individuals exists.			✓	54
43	Kämmer et al. (2017)	Despite the authors did not explicitly explained the types of thinking required, the article explained *CI* as the function of thinking process among the team members.			✓	29
44	Kim et al. (2017)	Posit a correlate between *CI* and the general social perceptiveness of the team members.			✓	63
45	Mayo & Woolley (2017)	*CI* is influenced by team coordination and communication patterns.			✓	2
46	Aggarwal & Woolley (2018)	*CI* is contributed by individuals' expertise, thought processes, resources utilisation and speed.		✓		27
47	Elia & Margherita (2018)	Stakeholders can generate *CI* to solve complex social issues by tapping into the social capital.	✓		✓	19
48	Kaur & Shah (2018)	*CI* is affected by the capability of groups to exercise coordination, networking, embracing diversity and upholding independence.			✓	1
49	Huang & Chin (2018)	*CI* is the outcome of individuals' expertise and experience in an area, while having the willingness to use the knowledge gained from other collaborations	✓			10
50	Massari et al. (2019)	The collective ability of human groups in solving different tasks and such ability is influenced by the social relationships between the members.			✓	4
51	Feldmann et al. (2019)	The outcome of the synergy owing to the coordinated, collaborative effort amongst individuals.			✓	4
52	Vercammen et al. (2019)	Fostering substantial intellectual capacity through crowdsourcing so that assembled groups collectively exceed the performance of the best-performing individuals within the group.	✓			5
53	Dellermann et al. (2019)	CI can be foster through the seamless collaboration between human and machines.		✓		27
54	Elia & Margherita (2020)	*CI* can be fostered through the socialisation process within digital entrepreneurship ecosystem.			✓	21
55	Suran, Pattanaik & Draheim (2020)	The literature review of *CI* proposed various outlooks, but the findings also suggested that there is a lack of publications that integrate of all three categories.	-	-	-	8

However, before this Section can offer a working definition for *CI* for the purpose of this study, it has to first discuss the term “cognitive–behaviour” and it should be examined when one attempts to study the antecedents for *CI*. In addition, Table 2.1 demonstrated that apart from two of the articles which attempted to introduce some aspects of all three categories of cognitive-behaviours (Gregg, 2009; Lesser et al., 2012), a *CI* predictive framework that comprises interconnected aspects of cognitive-behaviours of the team members has not been established (Kaur & Shah, 2018; Paletz & Schunn, 2010; Suran et al., 2020; Woolley et al., 2015; Yu et al., 2018).

2.4.2 Cognitive–behaviours as the clue for collective intelligence

Factors affecting the level of intelligence in adults and organisations remain as a contentious topic (Ackerman, 2017; López-Robles, Otegi-Olaso, Gómez & Cobo, 2019). Ackerman (2017, p. 987) stated, “There is little reference to adult intellectual functioning outside of laboratory-based tasks and clinical assessments of pathology. The result is that there are insufficient criterion measures for adult intelligence…… (there) is a disconnection between basic research on one hand and understanding adult intelligence on the other hand. This lack of connection is a serious impediment for predicting individual differences in performance on tasks which adults perform in their day-to-day work and nonwork lives……”, and further argued that, “a fundamental re-examination of how adult intelligence is studied and applied“ should be carried out. But irrespective of an extensive history of investigation and dispute, it is commonly agreed that intelligence is associated with how individuals think and behave (Legg & Hutter, 2007), in other words, the cognitive–behaviours.

Anchored on the cognitive tenet, Herrnstein and Murray (Herrnstein & Murray, 1994) attribute intelligence as a "*cognitive ability*". Simonton (Simonton, 2000), on the other hand, states that intelligence is a set of cognitive capacities that enable individuals to carry out actions which allow them to adapt and thrive in any given environment. Whereas for the behavioural tenet, Das (1980) proposes that intelligence is the capability in which individuals plan and structure their behaviours with an end goal in mind (Das, 1980). Other scholars have proposed that intelligence can be regarded as the expression of behavioural patterns by an individual as he or she attempts to deal with novel situations more appropriately and effectively (Eysenck, 1979; Freeman, 1925). The link between cognition and *CI* has been elaborated (Steyvers & Miller, 2015). However, originating from behaviourism, cognitive-behaviourists argue that it is difficult to accurately ascertain the thought-process of an individual. It is more effective to regard all cognitive-behaviours of an individual as the consequences of the individual's mental constructs and thinking capabilities response to specific environmental stimuli (Case & Bereiter, 1984; McKimm, Da Silva, Edwards, Greenhill & Taylor, 2015).

Canonico, Flathmann and McNeese (2019, p. 1466) assert that "cognitive science is not just a study about the human mind: it's also a study in information processing and neurological behavior. Through those lenses, it becomes possible not only to examine individual behavior, but also to investigate social behavior. Team science lies at the intersection between researching individual and group psychology, and actively deals with how collections of individual people coordinate most effectively". In a similar light, for this study, it is difficult for the participants of the survey and researcher to confidently assess another participant's thought process. But it is possible to correlate the behaviours of a participant as clues to the style and depth of their cognition process. Requesting team members to evaluate the cognitive–behavioural proclivity exhibited by themselves and by their teammates may provide one with a valuable insight into what makes a team intelligent.

Lastly, similar to the notion that adult intelligence is generated as the result of multifaceted cognitive-behaviours (Ackerman, 2017; Legg & Hutter, 2007), this study would thus like to argue that it is the right combination of cognitive-behaviours of the team members who work collectively and synergistically that lead to an increase in *CI*. Therefore, irrespective of age, gender and ethnicity of the participant, it is how the individual exercises certain cognitive-behaviours in combination that affects the *CI* of the team. Therefore, instead of probing the causation between *CI* and these biological attributes, this study will leave them out of the research scope but focus on examining how research participants evaluate the cognitive-behaviours exhibited by them and their team members as collectives.

2.4.3 The working definition of collective intelligence for this study

Based on the arguments stated in Sections 2.4.1 and 2.4.2, the following working definition of *CI* is proposed for the context of this research:

> *"CI is the outcome of an effective combination of synergistic cognitive–behaviours exhibited by collaborators that enable their teams to solve diverse challenges contextually and achieve common objectives effectively."*

In addition, this working definition is formulated in response to the call for *CI* studies that can integrate cognition, behavioural and social aspects of antecedents as previously discussed in Section 2.2.3 (Aggarwal & Woolley, 2018; Canonico et al., 2019; Kaur & Shah, 2018; Mello & Rentsch, 2015; Paletz & Schunn, 2010; Smith, 2008; Woolley et al., 2018). However, it is essential to highlight that the accuracy of this working definition can only be ascertained by the end of the study based on the empirical findings obtained.

2.5 Cognitive–behavioural clusters of the preliminary framework

Our understanding of which cognitive-behavioural factors can be deemed as critical antecedents for team performance and innovativeness needs further improvement (Friedrich & Ulber, 2017; Theeke, 2016). The primary purpose of this section is to propose critical overarching clusters of cognitive–behaviours that can serve as the basis of the theoretical framework of this study. Motivated by the outcome of the analysis conducted in Sections 2.4.1.2, 2.4.1.3 and 2.4.1.4 which suggested *CI* of the small team can be affected by how team members harvest and use resources, think effectively and socialise among themselves. These insights channel this study to investigate selected three clusters of cognitive-behaviours and further termed these clusters as resource acquisition and utilisation (RAU), strategic thinking (ST) and team members exchange (TMX), respectively. The specific cognitive-behaviours per each cluster will be discussed in Section 2.6.

2.5.1 Cognitive–behavioural cluster 1: Resource acquisition and utilisation

Considering that corporate innovation can be complex, it requires incumbents to harvest, aggregate, select and utilise crucial knowledge and other forms of resources as the basis to generate new value (Colombo, von Krogh, Rossi-Lamastra & Stephan, 2017; Hastie & Kameda, 2005; López-Nicolás & Meroño-Cerdán, 2011; Vercammen et al., 2019). In other words, collaborators within small teams must work synergistically to gather and utilise the appropriate resources in support of ideating superior business concepts that may be deemed highly noteworthy by the leaders of the organisations (Grundy, 2000; Mayo & Woolley, 2017; Patanakul & Shenhar, 2012; Turner & Müller, 2003). This research terms such cognitive–behaviours such as "*Resource Acquisition and Utilisation*" (RAU). For the purposes of this study, "RAU" is defined as the ability of a team to secure the resources, such as critical information and helpful knowledge, in a well-timed manner and subsequently appropriating the resources to generate innovative ideas.

The connection between knowledge sharing and organisational innovation has been validated (Jiang & Chen, 2018; Moser et al., 2019). Lin, Chen, Hsu and Fu (2015) demonstrated that, based on data collected from 215 team project managers, having complementary knowledge and the ability to allocate resources play a profound part on problem-solving effectiveness. Knowledge diversity has been posited as a positive mediator for team innovativeness (Mannix & Neale, 2005; Van Knippenberg, De Dreu & Homan, 2004).

Any team's capability to acquire an adequate level of resources, such as information and knowledge, beyond the confined organisational boundary plays a critical role towards team innovativeness. Such information gathering process must involve a wide range of actors, including stakeholders from within and outside of the organisation (Dahlin, 2019; Woolley, Bear, Chang & DeCostanza, 2013). This includes employees, customers and subject matter experts. Studies have demonstrated that teams consisting of members who have high boundary-spanning prolificacy can enable their organisations to increase innovativeness and performance (Dey & Ganesh, 2017; Keszey, 2018; Olabisi & Lewis, 2018; Velez-Castiblanco, Brocklesby & Midgley, 2016). Despite that boundary-spanning literature have pointed out various mediating factors and determinants on how teams can be structured to improve intra- and inter-team coordination to improve the resource gathering effectiveness (Drach-Zahavy & Somech, 2010); Olabisi & Lewis, 2018), research has not conclusively explored how *CI* of the small teams can be affected by the level of boundary-spanning of the team when team members interact with different types of stakeholder, such as top management, internal peers, external experts and customers. In addition, the ability to gain stakeholders' support and collect resources are two of the essential components of effectuation (Sarasvathy, 2001). Effectuation is a theory that reflects how successful entrepreneurs exhibit a set of cognitive–behaviours to improve the state of their entrepreneurial pursuits. With abductive logics and iterative refinement, in part owing to the resources gathers, entrepreneurs were able to improve their offerings or goals or both (Sarasvathy, 2001). To date, effectuation theory has been applied at the individual context

(Fisher, 2012; Sarasvathy, Kumar, York & Bhagavatula, 2014) and increasingly to the organisational level (Brettel, Mauer, Engelen & Küpper, 2012; Futterer, Schmidt & Heidenreich, 2018). The scholarly understanding of how effectuation may affect *CI* at the smart team level remains scarce.

Being solely reliant on boundary-spanning may not be enough to improve team innovativeness. Scholars have suggested that research has failed to find consistent results when attempting to uncover the underlying factors leading to this causality (van Knippenberg, De Dreu & Homan, 2004; Tang & Ye, 2015). Although having a healthy level of collaboration among the members enables the groups or teams to secure more resources such as information, knowledge, funding, infrastructures, human capital and stakeholder support (Wang & Hu, 2017), some researchers posit that the relationship between product innovation and knowledge integration mechanisms is not straightforward (Tsai, Liao & Hsu, 2015). Too little or too much knowledge may dampen the innovativeness of the team (Tsai et al., 2015). In addition, some researchers dispute that it is not the quality, nor the quantity of the knowledge acquired by the team members, which indeed affects the team innovativeness. The innovativeness is harnessed through the manner in which the team members utilise the knowledge (Curado, Oliveira, Maçada & Nodari, 2017). Similarly, after Mehta and Mehta (2018) studied 90 self-directed teams which took part in an extended business simulation, the researchers posit that the knowledge integration ability among the team members is also an important facet towards attaining successes. Likewise, in a peer-reviewed article titled "absorption, combination and desorption: knowledge-oriented boundary spanning capacities", Denford and Ferriss (2018) argued that while knowledge exploration through boundary spanning is an important step, the capability of the team to exercise knowledge integration leads to the knowledge absorption.

Does everyone in a small team need to exhibit the cognitive-behaviours of resource gathering and selective utilisation in order to strengthen the *CI*? Or can *CI* be harnessed effectively with only selected members of the team to carry out the resource acquisition cognitive–behaviours? Which types of stakeholders will impact the level of *CI* more critically than others? These are some of the *CI* related questions that have yet to be addressed by literature to date. Hence, the cognitive–behaviours of the utilisation of the resource were incorporated as the first cluster.

In short, knowledge exploration (spanning across a wide range of key stakeholders, such as top management, internal peers, external experts and customers), integration (through absorptive and combinative capability) and utilisation (select and prioritise) must be subjected to investigation. Based on the aforementioned rationales, this research examines the mediating effects of the following six hypotheses factors; 1) H1: management input, 2) H2: intra-organisational connection, 3) H3: external perspectives, 4) H4: customers involvement, 5) H5: expansive ecosystem, and 6) H6: integrative combination. More extensive discussions for these hypotheses will be presented from Sections 2.5.1 to 2.5.6.

2.5.2 Cognitive–behavioural cluster 2: Strategic thinking

It has been reported that an incumbent's cognition ability influences how his or her firm may uplift the innovation trajectory (Zahra & Nambisan, 2012), eclipse its rivals (Benito-Ostolaza & Sanchis-Llopis, 2014; Moon, 2013) and confront contemporary challenges (Hornett & Lee, 2017). Many researchers have also suggested that how collaborators or team members commit their cognitive resources to the existing challenges can shape the level of the innovativeness as collectives (Trianni, Tuci, Passino & Marshall, 2011; Zembylas & Vrasidas, 2005; Zettsu & Kiyoki, 2006). Without having team members heightening their strategic thinking capability to formulate the nascent concepts, the pursuit to acquire and utilise resources may become a wasteful process. Hence, this study selects strategic thinking theories the second anchoring cognitive–behavioural clusters of hypotheses to be subjected to the investigation. This study defines strategic thinking (ST) as the style and capability of one's cognitive process that influences how one makes decisions and solves problems.

While several scholars have offered their views on the constructs of strategic thinking (Bonn, 2001; Heracleous, 1998; Liedtka, 1998; Mintzberg, 1994; Moon, 2013; Nuntamanop, Kauranen & Igel, 2013; Thompson Jr, 1996), Liedtka (1998) is one of the first scholars to offer a clearer description and the five elements of her strategic thinking principles have since been widely adopted by educators and practitioners. Liedtka (1998) posits that effective strategic thinking consist of the following five principles: "a system perspective", being "intent focused", "thinking in time", being "hypothesis-driven", and acting in an "intelligently opportunistic" manner. However, a majority of these widely-accepted strategic thinking principles, including the ones proposed by Liedtka have never been empirically tested. Hence, it is of scholarly interest to include these five principles into the 2nd cognitive–behavioural cluster.

As the volatility, uncertainty, complexity and ambiguity of the business landscape are constantly increasing, the style in which leaders think strategically must also evolve (Bennett & Lemoine, 2014; Millar, Groth & Mahon, 2018). This research also identifies at least three weaknesses across the majority of descriptions of strategic thinking proposed by the scholars and therefore decided to introduce three additional hypotheses, *viz*. effectual reasoning, challenge biases and credulous reflexivity, to supplement Liedtka's five principles (1998).

Adopting from Sarasvathy's effectuation (2004), a theory that was briefly discussed in the previous cognitive–behavioural cluster, *effectual reasoning* is a form of problem-solving cognitive-behaviour which regards that although the future is unpredictable, it is somewhat controllable through individuals' actions. It stated that entrepreneurs are able to make progress in their entrepreneurial endeavours by making choices and refining goals contextually instead of treating choices and goals as fixed preference. (Other elements of effectuation, such as resource gathering and stakeholders support, are incorporated in the RAU cognitive-behaviour cluster as previously discussed). The ethos of effectual reasoning is somewhat in direct contradiction with Liedtka's "intent focused" (Liedtka, 1998). While effectual thinking styles nudge teams to be agile and adaptive, Liedtka's "intent focused" principle underscores the action that calls for individuals to make a concerted effort to maintain the focus on the pre-defined goals, to channel their resources and to prevent distractions for as long as it takes to achieve a goal (Liedtka, 1998; Sarasvathy, 2004).

The cognitive–behaviours of *challenging biases* are included to supplement this cluster of cognitive–behaviours owing to the fact that human beings exhibit an inclination to suffer from a variety of biases (Kahneman & Miller, 1986; Kahneman & Varey, 1990; Liedtka, 2015; Roese et al., 2006). The extent to which this cognitive-behaviour, in comparison with others, affects *CI* remains an intriguing question. Lastly, *credulous reflexivity* refers to the capability of an individual or a team of individuals to ponder upon the current operating logic, the progress to date and, when required, change the frame of reference for their decision-making cognitive–behavioural process (Stompff, Smulders & Henze, 2016; (Schippers, West & Edmondson, 2017).

For this cluster, eight hypotheses in total were proposed and subjected to evaluation, and they are: 1) H7: intent focused, 2) H8: a systems perspective, 3) H9: thinking-in-time, 4) H10: intelligent opportunism, 5) H11: hypothesis-driven, 6) H12: effectual reasoning 7) H13: challenge biases, and H14: credulous reflectivity. A more in-depth discussion for each of the hypotheses will be offered in Sections 2.5.7 to 2.5.14.

2.5.3 Cognitive–behavioural factors 3: Team member exchanges

Innovation within the corporate settings is increasingly seen as an outcome of the helpful interactions among diverse individuals when they partner temporality to solve a particular challenge (Foss, 2018; Nisula & Kianto, 2016; Storey, Cankurtaran, Papastathopoulou & Hultink, 2016). Thus, researchers have suggested the importance of joining insights from cognitive science and social psychology for group innovation studies (Buffinton, Jablokow & Martin, 2002; Eriksson & Kadefors, 2017; Smith, 2008; Paletz & Shunn; 2010). Therefore, the last cognitive–behavioural cluster to be evaluated for the study is termed team members' exchange (TMX), and the theoretical underpinnings of this construct are rooted in the social exchange theory (Blau, 1964; Emerson, 1976; Rigtering & Weitzel, 2013). This study defines TMX as the exchange of cognitive–behaviours that affect the social relations amongst members.

Human beings tend to display collectivistic characteristics. According to Fahr (2107), team–member exchange occurs naturally in any team setting, where members automatically develop their preferred social exchanges with their fellow teammates. The independence, interdependence, differences and similarities of various traits among individuals within small teams affect their innovativeness and problem-solving performance as a whole (Steiner, 1972); (Santos, Uitdewilligen & Passos, 2015). Studies around what types of cognitive–behaviours of the exchanges between collaborators can affect *CI* have emerged as a fascinating research topic despite the fact that much work is still required to be done (Aggarwal & Woolley, 2018; Hill, 2014; Kaur & Shah 2018; Rosenberg et al., 2018; Woolley et al., 2010).

Extensive studies have discussed the complicated causality, or the lack of, between team innovativeness and various forms of socialisation among the team members. For example, different types of diversity (Hill et al., 2014; Hofhuis et al., 2018; Kratzer et al., 2017; Leung & Wang, 2015), team culture {Earley, 2000 #548), trust (Hughes, Rigtering, Covin, Bouncken & Kraus, 2018; Khan, Breitenecker, Gustafsson & Schwarz, 2015), empathy (Goyal & Akhilesh, 2007;

Woolley et al., 2010), overconfidence (Meissner, Schubert & Wulf, 2018) and *inter alias*. Even though, social interaction between the team members has been reported to affect the level of *CI* in the team (Woolley, Aggarwal & Malone, 2015), our understanding of the kind of social exchange cognitive–behaviours that can impact *CI* needs to be improved. Researchers have further called for more research that can bridge our knowledge gaps in some of the intricacies of team members' exchange under different scenarios (Litchfield, Karakitapoğlu-Aygün, Gumusluoglu, Carter & Hirst, 2018; Massari et al., 2019).

Individuals' capabilities to collectively and timeously make effective decisions is considered to be a significant factor when teams engage in a complex project (Hansen & Vaagen, 2016). Having a sense of urgency has been considered to be a helpful attribute for teams that drive innovation (Schepers, Schnell & Vroom, 1999; Shenhar, Holzmann, Melamed & Zhao, 2016) and other researchers have suggested the importance of innovation speed (Ries, 2011; Shan, Song & Ju, 2016). All of these require team members to have a disciplined approach. However, not only do the investigations around the relationship between adopting a disciplined approach and the output of innovation remain scarce (Byrne, Lubowe & Blitz, 2007; Euchner, 2017; Thompson, 2004), there is a scarcity in empirical investigations on the relationship between individuals' disciplined approach to drive innovation projects, i.e. meeting the timeline and consistently investing effort into the tasks, and the quality of the output. Moreover, how the informal accountability of the team members may shape the overall *CI* of the team poses yet another interesting question.

While some scholars have proposed that exercising shared leadership is beneficial to team's *CI*, innovativeness and performance (Woolley et al., 2010; Hill, et al., 2014; Hoch, 2013), others have suggested that shared leadership merely improves the team's effective organising and planning capabilities (Choi, Kim & Kang, 2017). As different team members may take on different team roles (Fisher, Hunter & Macrosson, 1998) – some are great at leading and others are great at supporting – the question then is; should *shared leadership* be a highly critical factor for *CI*? Tasking these types of supportive team members to lead aspects of innovation endeavours may reduce the flow of these individuals and negatively impact the overall team innovativeness (Hooker & Csikszentmihalyi, 2003). Unfortunately, there is a limited amount of research on whether non-intrapreneurial or less innovative employees can also become valuable assets towards team innovativeness.

Owing to the fact that team members exchange can cover a wide array of plausible factors, this research made a concerted effort to streamline the six hypotheses based on the following factors: 1) H15: shared leadership, 2) H16: informal accountability, 3) H17: disciplined delivery, 4) H18: positive transfer, 5) H19: constructive conflicts, and 6) H20: idea inclusivity, subsequent subsections will motivate the reasons these factors were selected. More discussion on these hypotheses will be offered from Sections 2.5.15 to 2.5.20.

2.5.4 Beyond the cognitive–behavioural factors

It is important to mention that a wide array of factors that are beyond the scope of cognitive–behavioural factors of the team members can affect the intelligence and innovativeness of small teams (Hill et al., 2014). For example, from the internal perspective, one can find organisational strategy (McAdam & McClelland, 2002), dynamic capability (Song, Lee & Khanna, 2016), internal politics (Franke & Foerstl, 2018), employee job fit (Afsar, Badir & Khan, 2015), team size (Eliaz & Wu, 2018; Weiss & Hoegl, 2016), incentives (Kanama & Nishikawa, 2017; Mann & Helbing, 2017), organisational environment (Chen, Li, Chen & Ou, 2018; Danks, Rao & Allen, 2017; Kratzer et al., 2017) and organisational structure (Lee, Min & Lee, 2016) as some of the factors. innovation systems (Kanama & Nishikawa, 2017), outsourcing (Aubert, Kishore & Iriyama, 2015) and stakeholder network (Tang & Ye, 2015) have also been identified as some of the external factors influencing the innovativeness of the teams. Therefore, these "non-cognitive-behavioural" factors do exacerbate the level of difficulty when one attempts to investigate *CI* in the real-life environment.

An effective study that aims to unpack the effect of selected cognitive–behaviours of individuals on *CI* should ensure these factors do not significantly skew the outcome of the empirical investigation. Using ALP competition as the proxy is a smart way to reduce the potential influences of these factors while allowing the research design not being too far removed from the business conditions. However, it is important to note that while using ALP competition can lessen the effect of these "non-cognitive-behavioural" factors, it may not completely remove some of them. The methodical limitations of this study still exist, and more discussions on this topic will be presented in Chapter 3.

2.6 Preliminary theoretical framework and hypotheses

Extending from the insights generated from 2.5.1 to 2.5.3, a preliminary theoretical framework was constructed, and Figure 2.2 illustrates this framework. This research does not intend to test all plausible factors. It will focus on twenty cognitive–behaviours from three different clusters and leverage them to serve as the hypotheses and for the purpose of refining this preliminary theoretical framework. These cognitive–behaviours are also included in Figure 2.2. Sections 2.6.1 to 2.6.20 will offer succinct explanations behind the selection of each of the 20 hypotheses and the relevant literature for each of the hypothesis.

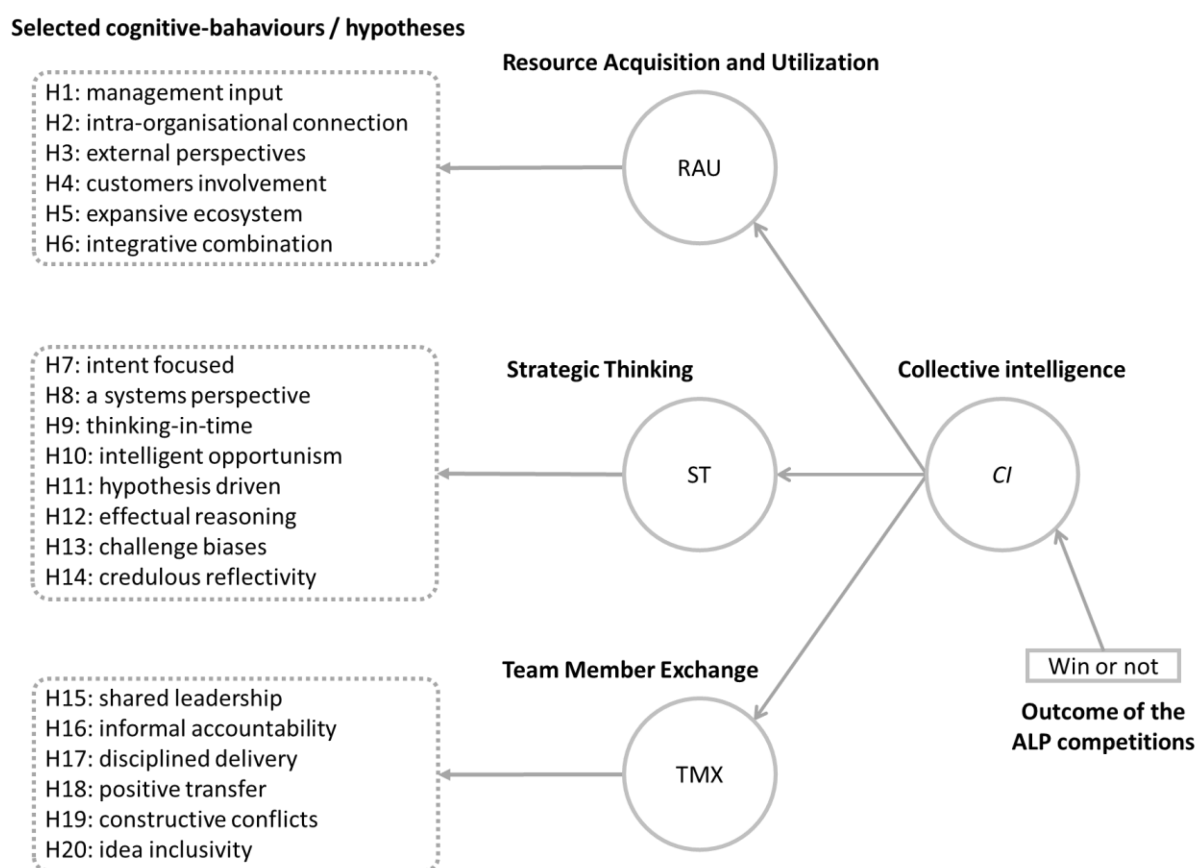

Figure 2.2 Preliminary theoretical framework for harnessing CI in small teams (author's own)

2.6.1 Hypothesis 1: Management input

This research defines ‘management inputs’ as all arrays of information and knowledge, both formal and informal, provided by the senior and executive management.

Studies have shown that top management influence corporate entrepreneurship (Kuratko et al., 2014) organisational innovation (Jiang & Chen, 2018; Sipe, 2016) and intrapreneurship (Neessen, Caniëls, Vos & De Jong, 2019). However, a contrary view was proposed (Viegas et al., 2016). The empirical findings based on a study of 44 professionals in six teams, suggested that high performing teams *do not* consider managers’ involvement as a highly important factor towards the overall success as it has been posited by numerous literature to date (Viegas et al., 2016). More studies today, in particular within the research fields on the software innovation and agile team, advocate the benefits of self-organising teams and promote the notion of reducing management inputs (Augustine, 2005; Nkukwana & Terblanche, 2017). Whether the inputs from the management will enhance the *CI* of small teams or not, and to what extent, are some of the research questions which remain unanswered.

In one of their latest peer-reviewed articles published in the Academy of Management Annals, (Oreg & Berson, 2019) stated that, “The notions of leadership and organisational change have been closely linked and frequently discussed in tandem. Whereas we know much about leadership and change, we know relatively little about the integration of the two. Leadership is often discussed with respect to its impact on organisations in times of change, and the literature on organisational change frequently notes the roles that managers and change agents have, as change leaders. Yet, surprisingly, the impact of leaders in change has not been studied systematically". Prior research supports the negative impact of managerial control on the motivation of employees (Allen, Adomdza & Meyer, 2015). Based on these research gaps identified, hence, this research proposes the following hypothesis:

Hypothesis 1_0: *CI of a small team is positively affected by the cognitive-behaviours of attaining key knowledge from senior management.*

2.6.2 Hypothesis 2: Intra-organisational connection

This research defines 'intra-organisational connection' as the linkage, tie or association between one or more team members with other employees within the organisation and through such a connection, useful information or knowledge is obtained.

There are known benefits of promoting inter-divisional partnerships within an organisation for development, and innovation and such practice is increasingly becoming a prevalent corporate innovation ethos (Harvey, 2017; Zhang & Tang, 2017). Researchers have shown the innovativeness of organisations as a result of an increase in intra-organisational connection through reducing organisational boundaries (Kuratko et al., 2014). Reducing organisational boundaries allows creative individuals more opportunities to accelerate their innovativeness owing to the outcomes of their boundary-spanning behaviours (Pick et al., 2015). Dibble and Gibson (2018) highlight that given the context of modern-day business environments, teams must be dynamic, and the members must be able to operate across team boundaries. To cultivate trust between employees from different units is a necessary prerequisite to foster and encourage resource sharing among them (Park & Kim, 2018). However, even though knowledge-sharing across the internal boundaries between units plays an essential part towards a firm's innovativeness, unfortunately, most of the knowledge is not transferred across the internal boundaries in a majority of the organisations (Aalbers & Dolfsma, 2015).

To what extent does an increase in the cognitive–behaviour of intra-organisational connections among the collaborators in a small team affect the *CI* of the small teams? This is a question that is yet to resolve. In addition, Johnsson (2018) pointed out that not all team members are creative and innovative. Some of them are great innovation facilitators. Adding on from this trend of logic, one is compelled to ask; do all members have to be boundary-spanners? Instead of enforcing all members to become boundary-spanners, will the *CI* of a small team increase if some members exercise their boundary-spanning behaviours and share the resources acquired with the remaining team members? Alternatively, when all members exercise some form of boundary-spanning to increase the internal connection, does the *CI* positively increase further as opposed to relying on a few individual members to increase the internal connection? To date, studies have not made any conclusive remarks concerning these questions, and therefore this research proposes the following hypothesis, while addressing the above–mentioned knowledge gaps:

Hypothesis 2_o: *CI of a small team is positively affected by the cognitive-behaviours of connecting the team with helpful intra-organisational units.*

2.6.3 Hypothesis 3: External perspectives

As the competitiveness within the business environments heightens, small teams are compelled to upsurge their efforts to increase external linkages (Bahemia, Sillince & Vanhaverbeke, 2018); (Lee & Sawang, 2016). Team members' familiarities and connections with the market dynamics and possible sources also support the success of their corporate innovation endeavours input from the external parties (Bahemia et al., 2018; Didonet et al., 2016).

Within the context of this research, the term "external perspectives' covers the viewpoints and opinions of experts and key stakeholders (apart from customers) outside of the organisation. Having a diverse external collaboration can alleviate internal resource limitations that lead to greater competitive advantage, higher profitability and superior future preparedness (Gkypali, Filiou & Tsekouras, 2017; Holtzman, Puerta, Lazarus & Anderberg, 2011).

However, Arfi, Hikkerova and Sahut (2018) demonstrate that external knowledge does not necessarily nor successfully convey innovative outputs, and there is an inadequate understanding of how knowledge sharing can develop innovation in SMEs. The linkage between external knowledge and *CI* of small teams has not been empirically validated. To some extent, owing to these rationales, this research advances the following hypothesis:

Hypothesis 3_o:	*CI of a small team is positively affected by the cognitive-behaviours of ascertaining critical knowledge from key external stakeholders.*

2.6.4 Hypothesis 4: Customers' involvement

Highly successful innovations always begin with understanding the customers' 'jobs-to-be-done'; in other words, the higher purpose for which customers buy your offerings (Christensen, Hall, Dillon & Duncan, 2016). Extensive studies have shown that involving customers in the co-creation of new offerings benefits both the customers and the organisations that aim to derive better offerings (Chan, Yim & Lam, 2010; Johansson, Raddats & Witell, 2019; Markovic & Bagherzadeh, 2018; Meuter, Ostrom, Roundtree & Bitner, 2000; Prahalad & Ramaswamy, 2004; Witell, Kristensson, Gustafsson & Löfgren, 2011). Co-creating with customers allows firms to successfully adjust their operations to the shifts of customer needs (Etgar, 2008), whilst simultaneously increasing the sense of satisfaction and accomplishment of the customers involved in the co-creation (Meuter et al. 2000). It serves as one of the foundations of the popular problem-solving techniques known as 'Design Thinking' (Liedtka, 2015).

Despite the manner in which these studies demonstrated the multitude of organisational advantages when involving customers to co-create innovation, other studies have shown that co-creating with customers does not guarantee the positive advantage (Frow, Payne, Wilkinson & Young, 2011; Heidenreich, Wittkowski, Handrich & Falk, 2015; Markovic & Bagherzadeh, 2018). Moreover, scholars have suggested that customers do not always know what the best for themselves is nor do they always follow through with their own suggestions (Buell, Campbell & Frei, 2020; Ovans, 1998). Morgan, Joakim and Wincent (2017) present a counterintuitive finding and assert that the influence of market orientation on the absorptive capacity of the firm is diminished when customers are involved at deeper levels in new product development.

Based on these contrasting views, it is intriguing to explore how team members' cognitive–behaviours of involving customers can affect the *CI* of their small team. Thus, this research intends to evaluate the following hypothesis:

Hypothesis 4_o: *CI of a small team is positively affected by the cognitive-behaviours of involving the customers to derive solutions.*

2.6.5 Hypothesis 5: Expansive ecosystem

This study coins the term 'expansive ecosystem' and defines it as a team member's cognitive-behaviour to effectually expand his or her ecosystem in the pursuit of gathering more knowledge of relevance to the context of his or her mission. At a glance, this hypothesis may seem like a duplication of hypotheses H1, H2, H3 and H4. However, it is fluid in the pursuit of more resources dynamically that distinguish H5 from the previous hypotheses. The ethos of cognitive–behaviour of expanding the ecosystems to gather resource is well-aligned with the ethos of effectuation (Sarasvathy, 2001).

Teece (2018) asserts that an organisation's dynamic capability is highly dependent on its ability to leverage its ecosystems to create and capture value. Research has also demonstrated that an organisation's efficiency in absorbing external knowledge is associated with its effectiveness in creating radical innovation (Flor, Cooper & Oltra, 2018). Within the organisations, aspirant innovators and intrapreneurs embark on the path towards creating innovative ideas, whilst tackling typically experienced constraints such as rules and regulations, and resource scarcity (Balocco, Cavallo, Ghezzi & Berbegal-Mirabent, 2019; Kibirango, Munene, Balunywa & Obbo, 2017; Spigel, 2017).

From the resource-based view (RBV) departure, one can trace back to publications which have firmly asserted the significance of gaining resources when one pursues innovation and entrepreneurship endeavours (Barney, 1991; Wernerfelt, 1984). On the other hand, the attention-based view argues that it is how incumbents pay attention to the circumstances allow them to acquire the appropriate resources and develop effective tactics {Barnett, 2008}. Entrepreneurship and innovation researchers are increasingly leveraging both RBV and ABV tenets to unravel new insights (Kellermanns, Walter, Crook, Kemmerer & Narayanan, 2016; Kim, Kim & Foss, 2016), but the same enthusiasm has not been shared by the *CI* researchers. The relationship between how teams pay attention to expand their social ecosystem capital in pursuit of acquiring the appropriate resources and the magnitude of their *CI* becomes is a question that is yet to be explored.

This poses the question; can the *CI* of small teams be enhanced if the members habitually expand the breath, depth and quality of the respective ecosystems? Considering that connecting the dots can positively contribute to the innovativeness of individuals or teams (Hall et al., 2018), expanding the ecosystems allows these boundary-spanners to find more 'dots' (resources and knowledge) for their perusal. Based on these theoretical underpinnings, this research intends to validate the following hypothesis:

Hypothesis 5_o:	*CI of a small team is positively affected by the cognitive-behaviours of acquiring resources through expanding their social capital ecosystem.*

2.6.6 Hypothesis 6: Purposeful integration

The last cognitive-behaviour under the RAU cluster is the hypothesis termed "purposeful integration". This study defines 'purposeful integration' as the concerted effort to combine, dovetail and integrate the resources gathered in pursuit of solving a challenge contextually.

Valliere (2015) accurately summed up one of the aspects of entrepreneurial pursuits by stating that: "the process of becoming an entrepreneur can follow many idiosyncratic paths that differ in the details, but all share the same essential activities and steps." The statement was referencing how entrepreneurial individuals do effectually integrate and utilise the resources at hand. This cognitive–behaviour is analogous to the 'birds-in-hand' principle of effectuation (Sarasvathy, 2001) and the construct of bricolage (Fisher, 2012).

Teece (2018) stated that an organisation's dynamic capability is not merely dependent on how the organisation acquires resources, but it is also how it leverages its resources. By adopting complementary effectuation and bricolage actions, aspirant innovators, intrapreneurs or entrepreneurs can maximise their chances for success by experimenting with novel combinations of inputs and resources, and bypassing certain limitations or constraints (Baker & Nelson, 2005; Fisher, 2012). One can confidently recombine certain knowledge to yield innovative concepts when one can distinguish and assess the potential value of the knowledge at hand (Dokko, Kane & Tortoriello, 2014; Vick, Nagano & Popadiuk, 2015, Witell et al., 2017). The integrative capabilities of the organisations – how leaders select, filter, integrate and combine different resources to serve as the foundation for bricolage and effectuation – may play a critical part in the overall corporate innovation success (Arfi et al., 2018; Biedenbach, 2011; Helfat & Raubitschek, 2018; Venturini, Ceccagnoli & van Zeebroeck, 2019; Wang, Chen & Fang, 2018).

Therefore, this study will investigate the relations between 'purposeful integration' cognitive-behaviours and the *CI* of a small team by theorising the following hypothesis:

Hypothesis 6_o: *CI of a small team is positively affected by the cognitive-behaviours of effectively integrating available resources.*

2.6.7 Hypothesis 7: Intent focused

The first hypothesis to be included in the ST cognitive behavioural cluster is one of Lietka's strategic thinking principles, known as "intent focused". Intent focused can be regarded as a cognitive-behaviour that motivates leaders to concentrate thee efforts and counteract distraction to reach the objectives. It provides long-term orientation and permits managers to engender a sense of purpose (Liedkta, 1999; Norzailan, Yusof & Othman, 2016).

Entrepreneurial intention has been regarded as the dominance of attitude towards shaping beliefs, shifting behaviours and harnessing ideas (Urban & Chantson, 2019). This notion supports one of Liedtka's five strategic thinking elements, known as 'intent focused'. For example, scholars have attributed "entrepreneurial intention" as the construct that enables aspirant entrepreneurs to concentrate on their higher-level goals and overcome hurdles along their entrepreneurial journey (Carsrud, Brännback, Elfving & Brandt, 2017). It is with such intense focus, entrepreneurs act concertedly to find and pursue the potentially valuable connections and resources in an attempt to maximise the chances of success (Engel, Kaandorp & Elfring, 2017).

However, other scholars have argued that it is not the strategic intent that steers an individual or organisation's modus operandi to a grand success, but it is the actual strategy and the practice of strategy adaptably. The adaptability to change critically empowers the organisation to become more competitive (Mintzberg, 1994; Prahalad & Hamel, 1994; Sarasvathy, 2001). Firms and entrepreneurs that thrive in this fast-changing business landscape are the ones that have figured out how to adapt within the new transient advantage economy (Christian, Christian, Pearsall & Long, 2017; McGrath, 2013; O'Donovan & Flower, 2013). Therefore, even though studies have argued that forming a strategic intention fuels effectuation logic (Valliere, 2015), unless the said intent is about continually adapting to this changing work, focussing on an *a priori* defined end-goal too rigidly and discarding the emergent idiosyncrasy of the situation will hamper the value creation owing to the lack of effectuation.

These conflicting views lead to the question - can a firm or an individual become continually re-strategised along the way based on the circumstances at that particular moment in time, especially if high levels of uncertainty are involved? This begs for further investigation between the relationship of “intent focused” and *CI*. The notion of “intent focused” could also somehow be in conflict with “effectual reasoning”, rooted in the theory of effectuation (Sarasvathy, 2004), and this research intends to test this notion as Hypothesis 12. More researchers are calling for more scholarly attention to how intentions affect entrepreneurship and innovation (Fayolle & Liñán, 2014; Krueger, 2017). The relationship between *CI* and the intention of individuals and teams are some of the exciting topics that are still yet to be uncovered. This research thus presents the following hypothesis:

Hypothesis 7_o:	*CI of a small team is positively affected by the cognitive-behaviours of focussing firmly on the intent.*

2.6.8 Hypothesis 8: A systems perspective

To solve complex challenges, leaders must develop a holistic perspective of the business environment, the value-chain of activities in their organisations (Liedkta, 1999; Norzailan, Yusof & Othman, 2016). It is not enough for them to adopt a bird’s eye view if they are not familiarising themselves with the interconnectedness and interdependencies between the activities as well as with the environment (Senge, 2006). Instead of breaking down a challenge into its parts or merely seeing certain parts, systems thinking focusses on the relations between parts and the outcomes owing to these relations (Zhu, Zhang & Lang, 2015). Developing a systems perspective is essential when leaders attempt to foster transient competitiveness in their organisations. It permits leaders to transpose between the macro-level view and micro-level intricacies. Strategic thinking must therefore also be systemic so that the association and unintended wicked causal effect and the indeterministic enactment between different components can be evaluated (Pourdehnad, 2007; Kapsali, 2011; Zahra & Nambisen, 2012).

Owing to the synthetic, integrative underpinning ethos, systems thinking methods empower leaders to be more flexible, and innovative when navigating in a world filled with complexity and uncertainty in innovation (Basile, Kaufmann & Savastano, 2018; Kapsali, 2011; Senge, Lichtenstein, Kaeufer, Bradbury & Carroll, 2007). Despite the fact that systems thinking has been found to be highly pertinent for dealing with complex problems, individuals still tend to neglect the power of this cognitive behaviour (Trivedi & Misra, 2015). Moreover, the construct of systems thinking has not been validated against *CI*, particularly within the context of experimenting how teams can utilise these cognitive-behaviours to solve a strategic challenge better.

As the causality between *CI* and the cognitive-behaviour of taking on "a systems perspective" has not been explored, the following hypothesis is subjected to the empirical investigation process.

Hypothesis 8_o: *CI of a small team is positively affected by the cognitive-behaviours of systems thinking.*

2.6.9 Hypothesis 9: Thinking-in-time

Individuals who exercise effectuation typically make a concerted effort to frequently visualise all plausible futures as they venture on with their pursuits. By so doing, it allows them to innovate, plan and accordingly make provisions (Sarasvathy, 2004; Adegbile, Sarpong & Meissner, 2017). Effectively visualising different future scenarios requires one to exercise certain levels of temporal cognitive flexibility – in other words, thinking back-and-forth in time using multidimensional divergent lenses (Botha, 2016). This deliberate practice empowers these successful individuals to reconcile various competing assumptions and upturn one's prospects (Zahra & Nambisan, 2012; McKiernan, 2017). With the right level of creativity, intelligence, hindsight and insight, thinking-in-time cognitive-behaviour can help decision-makers to predict challenges and spot opportunities that may arise over the medium and longer-term time horizon (Kock, Heising & Gemünden, 2015; Roese, Fessel, Summerville, Kruger & Dilich, 2006), Liedtka, 1998; Norzailan, Yusof & Othman, 2016; Zahra & Nambisan, 2012).

Using foresight to create mental simulations of future events (Bromberg, Lobatcheva & Peters, 2017; Hoyle & Sherrill, 2006; Lesser et al., 2012) in conjunction with hindsight to connect the pieces from the past (Bar, 2009; Elsback et alia, 2005) and linking with the organisational context (Kaplan, 2008; Rouleau, 2005) can enrich leaders' problem-solving efficacies, strategic intelligence and creativity (Capurro, Galeotti & Garzella, 2018; Stompff, Smulders & Henze, 2016). Particularly if individuals can apply creative thinking in the form of "upward" counterfactual thinking – imagining what-might-have-been to produce constructive options, (Baron, 2000; Kahneman & Miller, 1986; Kahneman & Varey, 1990). Thinking in time iteratively permits effectuators to be more mindful of what needs to transpire and what options can be deployed when they bridge the gap between the past, the present and the desired future (Liedtka, 1998; Norzailan, Yusof & Othman, 2016). Unfortunately, limited quantitative studies dedicated to validating the relationship between thinking in time and *CI* still exist. Validating the following hypothesis may minimise our knowledge gap for this particular context.

Hypothesis 9$_o$:	*CI of a small team is positively affected by the cognitive-behaviours of thinking-in-time.*

2.6.10 Hypothesis 10: Intelligent opportunism

The term 'intelligent opportunism' can be regarded as one's adaptive strategising approach that concentrates on recognising and exploiting an opportunity or opportunities under the circumstances (Liedtka, 1998). Research has documented the practical importance of opportunistic behaviour (Nielsen, 1982; Wathne & Heide, 2000). Successful innovators, entrepreneurs and intrapreneurs are skilled in leveraging various forms of situations to advance their positions. (Ngo, Bucic, Sinha & Lu, 2019; Sarasvathy, 2001; Tantalo & Priem, 2016). These individuals continually utilise the intelligent opportunism cognitive-behaviour to generate emergent strategies and piggyback on new opportunities (Benhong & Ye, 2008; Pandher, Mutlu & Samnani, 2017).

Creativity is an implicit facet of opportunism (Tasan-Kok, 2008). By being mindful of the emerging trends and subtle signals or by merely understanding how different processes and products work, individuals can uncover synergies between activities creatively and piggyback on the useful components to benefit their desired goals (Benhong & Ye, 2008; Govindarajan, 2016; Liedtka, 1998; Norzailan, Yusof & Othman, 2016).

The theoretical implications and the antecedent that enable piggybacking cognitive–behaviours as a tactic to solve challenges, enhance innovation, and facilitate knowledge exchange are noteworthy future research topics that require further attention from the scholars (Rosenbaum, Madsen & Johanning, 2019). Moreover, even though intellectual opportunism has been advocated as an essential principle of strategic thinking (Liedtka, 1999), it still required to be empirically validated. The relationship between *CI* and intellectual opportunism is also yet to be assessed. Therefore, this research intends to investigate the following hypothesis:

Hypothesis 10_o: *CI of a small team is positively affected by the cognitive-behaviours of intellectual opportunism.*

2.6.11 Hypothesis 11: Hypothesis-driven

The ability to influence and assist employees to generate relevant strategic hypotheses can be a powerful leadership attribute. The hypothesis generation management philosophy has established itself as the foundation to the contemporary strategic formulation process (Balocco et al., 2019; Davenport, 2009; Eisenmann, Ries & Dillard, 2012, Rasmussen, 2015 #429; Rasmussen & Tanev, 2015). Popular software development procedures or business model innovation methods are all somewhat based on a hypothesis-driven approach (Gutbrod & Münch, 2018; Osterwalder & Pigneur, 2010; Eisenmann, Ries & Dillard, 2012). Organisations can foster better problem-solving tactics and diminish wasteful efforts when individuals are invited to hypothesise how they can best achieve the desired strategic objective (Liedtka & Kaplan, 2019; Eisenmann, Ries & Dillard, 2012).

Adopting a continual hypothesising and re-examination of the hypotheses can enhance the agility and transient advantage of organisations (Ries, 2011). Particularly, if the leaders have the proclivity to leverage the right data to reduce the errors in their hypothesis-driven cognitive behaviours, many breakthrough hypotheses can be obtained (Shih & Chai, 2016); Eisenmann, Ries & Dillard, 2012). The impact of the data-centric evidence-based approach can be magnified when leaders can espouse effectual business planning, lean start-up and design thinking (Liedtka, 2015; Mansoori & Lackéus, 2019; Toro-Jarrín, Ponce-Jaramillo & Güemes-Castorena, 2016). Exploring the linkage between *CI* and "hypothesis-driven" cognitive-behaviours of the team members may lead to findings that would be of interest to academic scholars, practitioners and educators:

Hypothesis 11_o: *CI of a small team is positively affected by the cognitive-behaviours of hypothesis-driven.*

2.6.12 Hypothesis 12: Effectual reasoning

As previously discussed, effectual reasoning cognitive-behaviour enables entrepreneurs, innovators and designers to steer their teams to uncover, capture and create value. Despite the importance of effectual reasoning being widely advocated by experts (Archer, Baker & Mauer, 2009; Brettel et al., 2012; Dorst, 2011; Dunne & Dougherty, 2016; Futterer et al., 2018; Fisher, 2012, Hill; Brandeau, Truelove & Lineback, 2014; Sarasvathy, 2001; 2014; Brettel et al., 2012; Sull & Sull, 2018), adopting this helpful cognitive behaviour remains a challenge within the team context (Huff, 2016). This effectual reasoning (when combined with challenging biases) also permits leaders to deal with setbacks, as suggested by Sarasvathy's (2001; 2014) "lemonade" principle in the effectuation theory.

After conducting an in-depth search on the existing journal database, this study found that the number of empirical studies dedicated to the topic of "team effectuation" is negligible. The investigation on the interplays between "effectuation" and other management constructs resides mostly on the individual level or, to a small degree, corporate level. In addition, researchers have suggested that scant literature can be obtained on team adaptive performance (Christian et al., 2017). There is significant merit in examining the collective effectual process as a team and the interaction between the actors within the team that affects the adaptiveness and innovativeness of the team (Christian et al., 2017; Schmitt, 2018).

Seeing that the association between *CI* and effectual thinking of a small team has not reached a general consensus, thus, this research intends to validate the following hypothesis:

Hypothesis 12_o: *CI of a small team is positively affected by the cognitive-behaviours of effectual reasoning.*

2.6.13 Hypothesis 13: Challenging biases

Human beings have a high propensity to suffer from a variety of biases (Kahneman & Miller, 1986; Kahneman & Varey, 1990; Liedtka, 2015; Roese et al., 2006). Impediments to innovators and entrepreneurs oftentimes reside in their own mental traps that relate to the conformity for the dominant logic or foolishly anchoring strategic hypotheses on their biases. (Zahra & Nambisan, 2012). Leaders who have risen above constraints and bewildering challenges exercise some form of challenging biases type of cognitive-behaviours (Acar, Tarakci & van Knippenberg, 2019; Zahra & Nambisan, 2012). By focussing on the pursuit of growth (Dweck, 2016), individuals can reframe their biased views on how they see constraints and treat these hurdles as opportunities for growth.

A wide range of cognitive biases affects one's decision-making and problem-solving proficiency (Avery, McKay, Barnes Jr, 1984; Brescoll, 2016; Caniëls & Rietzschel, 2015; Liedtka, 2015, Reia, Amado & Fontanari, 2019; Rosso, 2014; Tversky & Kahneman, 1974; Volpone & Malka, 2015; Zhang & Cueto, 2017). The act of reframing and challenging one's own mental paradigm is important when encountering strategic hurdles as all sense-making processes such as deploying, various strategic thinking tactics anchor on some information and preconceived ideas. Therefore, one must challenge one's biases to ensure the information and mental paradigms are truthful, relevant and helpful. When necessary, reconstructing one's operating frame through an evidence-based approach will be required (Maurer & Githens, 2010; Rousseau, 2006; Stompff, Smulders & Henze, 2016; Liedtka, 2015).

The organisational practice of motivating employees to propose strategic hypotheses can lead to significant value if leaders could also encourage their people to justify their assumptions and challenge their own biases with urgency (Ross, 2019; Sull & Sull, 2018). In this fast-paced business environment with frequent disruptions, leaders must prioritise their efforts to reframe their constructs, challenge their own biases, timeously develop intelligent choices and reconcile numerous plausible strategic predictions (Bessant, Öberg & Trifilova, 2014; Zahra & Nambisan, 2012).

Even though to challenge team members' biases holds upsurge importance for the contemporary strategic management philosophy, Liedtka's (1998) five principles did not pay specific attention to this cognitive-behaviour. Equally, a majority of the thought-leaders did not stipulate the prominence of this factor (Abraham, 2005, Bonn, 2001, 2005; Graetz, 2002; Heracleous, 1998; Mintzberg, 1994, Moon, 2013; Nambisan, 2012; Saloner et al., 2001; Zabriskie & Huellmantel, 1991; Zahra & Mintzberg et al., 1998).

Owing to these rationales, the following hypothesis is presented in an attempt to validate the extent of challenging biases cognitive-behaviour on the overall level of *CI*.

Hypothesis 13_o: *CI of a small team is positively affected by the cognitive-behaviours of challenging biases.*

2.6.14 Hypothesis 14: Credulous reflexivity

The last hypothesis under the ST cognitive-behavioural cluster is termed “credulous reflexivity”. The extent to which the team members exercise reflexivity has been attributed as a helpful predictor of team innovativeness by Schippers, West and Dawson (2015) after examining the performance of 98 teams from the primary healthcare sector of the United Kingdom. Similarly, Litchfield et al. (2018) studied 61 teams from the research and development department comprising 305 employees and 61 team leaders and made the same discovery. Other researchers have also concurred with these findings and presented a range of other team benefits; inter alias, general performance, adaptability, creativity, and knowledge-sharing, when team members rehearse reflective practices credulously (Leavy, 2005; Mariano & Awazu, 2017; Schmutz, Lei, Eppich & Manser, 2018; Shin, Kim & Lee, 2017; Stompff et al., 2016).

Credulous reflexivity enables one to ascertain the value of one’s current operating logic, benchmark the current progress and, where necessary, reconstruct the frame of reference to incite a more superior decision-making process (Schippers et al., 2017). However, findings that caution the use of reflexivity as a standalone factor to team innovativeness and performance can also be found (Corgnet, Espín & Hernán-González, 2016; Moreland & McMinn, 2010; Schippers, West & Edmondson, 2017). For example, Corgnet, Espín and Hernán-González (2016) identified an inverted U-shape relationship between individuals’ creative thinking capabilities and their cognitive reflections. Other researchers also posit that reflecting too much may hinder creativity and stipulate that reflexivity can bring about a positive impact only when it is exercised under very specific team conditions (Moreland & McMinn, 2010; (Schippers et al., 2017). These different scholarly findings contributed towards the reasoning of testing *CI* against credulous reflexivity cognitive-behaviour of the members within the small team. The research therefore presents the following hypothesis:

Hypothesis 14$_o$: CI of a small team is positively affected by the cognitive-behaviours of credulous reflexivity.

2.6.15 Hypothesis 15: Shared leadership

The first hypothesis of the TMX cognitive-behavioural cluster is the construct of "Share leadership". It can be defined as the socialisation style that broadly distributes leadership responsibility, such that all team members will be given the opportunity to lead each other (Scott-Young, Georgy & Grisinger, 2019; Zhu, Liao, Yam & Johnson, 2018).

There has been an upsurge of research interest on shared leadership in recent years (Martin, Cormican, Sampaio & Wu, 2018). Shared leadership has been defined as the leadership that stems from the amalgamation of leaders among the members of teams instead of simply coming from the team leader" (Carson, Tesluk & Marrone, 2007; Ensley, Hmieleski & Pearce, 2006; Martin, Cormican, Sampaio & Wu, 2018; Mehra, Smith, Dixon & Robertson, 2006; Pearce & Sims Jr, 2002; Wang, Waldman & Zhang, 2014). Other scholars have denoted shared leadership as an informal type of team leadership existing within the team that distributes the leadership influence across individual team members (Carson et al., 2007; Hoch, 2013; Morgeson, DeRue & Karam, 2010). But despite its popularity, the literature on shared leadership has not reached consensus and opinions on the importance of this construct among the scholars are divided (Friedrich et al., 2016; Friedrich et al., 2009; Zhu et al., 2018).

After examining 64 research and development teams, (He et al., 2019) concluded that shared leadership can positively increase team members' individual creativity and creative self-efficacy that leads to improved team innovativeness and creativity. Other studies have also shown that teams that exercise shared leadership tend to outperform teams with a traditional top-down leadership approach (Carson, Tesluk & Marrone, 2007; Ensley, Hmieleski & Pearce, 2006; Martin et al., 2018; Mehra et al., 2016; Wang, Waldman & Zhang, 2014(Martin et al., 2018). From the *CI* research perspective, Woolley et al. (2010) proposed that the presence of shared leadership improves the *CI* of the team.

However, researchers have argued that different team members play different roles and not all team members would like to or have the capacity to lead will be leading neglected (Camps & Marques, 2014; Whelan et al., 2011). Johnsson (2018) further stated that not all team members are creative and innovative. Some of them are great innovation facilitators. Playing the facilitating role is also an important facet for a highly innovative team. (Camps & Marques, 2014) concurred with this sentiment and advocate the importance of the innovation enablers – followers who possess a set of general capabilities that facilitates others to innovate more effectively (Camps & Marques, 2014). Slant attention has been conferred on the role of leadership in corporate entrepreneurship and innovation, resulting an inadequate understanding of the importance and the impact of followership on innovation (Gobble, 2017).

Based on the conflicting research findings, this research, therefore, aims to validate the following hypothesis:

Hypothesis 15_o: *CI of a small team is positively affected by the cognitive-behaviours of exercising shared leadership.*

2.6.16 Hypothesis 16: Informal accountability

Informal accountability can be considered as the cognitive–behaviours of demonstration of one being accountable to or responsible for others under certain conditions even without a formal agreement or regulatory governed consequences (Hall, Frink & Buckley, 2017; Romzek, LeRoux & Blackmar, 2012; Royle & Fox, 2011). It arises from establishing a set of self-imposed unofficial expectations through one's discretionary behaviours (Romzek, LeRoux & Blackmar, 2012).

It has been suggested that one's informal accountability level can affect the innovation of the team one is affiliated to (Drach-Zahavy & Somech, 2001), by influencing followers to feel responsible towards certain aspects of the organisations (Arain, Hameed & Crawshaw, 2019) and promotes individual psychological ownership (Rau, Werner & Schell, 2018). While various scholars have suggested the positive contributing effect of informal accountability on team innovation and productivity (Drach-Zahavy & Somech, 2001; Hall et al., 2018; Kou & Stewart, 2018; Magpili & Pazos, 2018), other research has suggested that either too little or too much accountability can also be detrimental to the overall success (Hall, Frink & Buckley, 2017). Based on their empirical findings, Hall, Frink and Buckley (2017) stated that the connection between accountability and team performance may be a nonlinear one and displays numerous issues that have yet to be fully comprehended by scholars. Therefore, this research proposes the following hypothesis to uncover the causality between *CI* and informal accountability:

Hypothesis 16_o: *CI of a small team is positively affected by the cognitive-behaviours of exercising informal accountability.*

2.6.17 Hypothesis 17: Disciplined delivery

Extensive credible research articles have suggested that creativity and innovation can be accelerated when individuals apply a disciplined approach and embrace constraints (Euchner & Ganguly, 2014; Haught-Tromp, 2017; Herrera, 2015; Sull & Sull, 2018; Terziovski & Morgan, 2006; Zairi & Al-Mashari, 2005). This notion is supported by Ikeda & Marshall (Ikeda & Marshall, 2016) who find that highly innovative organisations approach their corporate innovation endeavours with a more disciplined, rigorous innovation practice after surveying more than 1 000 Chief Executive Officers and their subordinates. Herrera (2015) even suggests that the competitive advantage of a firm can be created by institutionalising a disciplined approach when the research examines various corporate social innovation initiatives. Similarly, based on the responses from 155 survey participants, ranging from consultants, academics to leaders from diverse industry segments, (Jones, Cope & Kintz, 2016) found that more than 80% of them agree that the success of the corporate innovation efforts requires the leaders to institute some level of discipline to ensure constancy in their innovation processes.

However, some researchers argued against the above findings. After sampling 188 postgraduate physicians, Patterson and Zibarras (2017) suggest that embracing a disciplined approach has a negative effect on creativity and innovation. Sagiv, Arieli, Goldenberg and Goldschmidt (2010) also posit that adopting a systematic (structured) style of problem-solving reduces individuals' creativity levels. The relationship between being disciplined and innovation performance persists as a research gap (Aulet, 2013; Carroll & Richardson, 2017). There is a scarcity of studies that aims to probe into the relationship between adopting a structured and disciplined approach for team innovation. Whether or not embracing a concerted disciplined style of driving the small teams will positively affect the level of the *CI* remains unanswered. It is owing to this research gap, that this particular research proposes the following hypothesis:

Hypothesis 17_o: *CI of a small team is positively affected by the cognitive-behaviours of being disciplined in the pursuit of delivering outcome.*

2.6.18 Hypothesis 18: Positive transfer

The journey of developing innovations can be rather laborious, a fact that is owed to the excessive number of unpredictable circumstances that may arise, which almost certainly lead to unforeseen problems. Therefore, it is crucial to manage motivation of the individuals within the team, as this may lead to positivity, which is a crucial component of a team (Lee, Mazzei & Kim, 2018; Pihlajamaa, 2017). Positivity has previously been described as the notion of experiencing positive, cheerful, and optimistic emotions (Fredrickson & Branigan, 2005; Walter & Bruch, 2008). It has also been described as a form of energy associated with the following emotional experiences; energetic arousal (Thayer, 1989), emotional energy (Collins, 1993) and positive affect (Watson, Clark & Tellegen, 1988). This research defines the positive transfer as the team members’ capabilities to create positivity despite previously encountering negative situations or not feeling positive.

Scholars have proposed that assessing team climate can be an excellent way to forecast team innovativeness and team performance (Smith-Jentsch, Salas & Brannick, 2001). Other studies suggest that positivity benefits individuals on an intrapersonal and societal level, and how embracing such a psychological state enables individuals to broaden their attention (Collins, Jordan, Lawrence & Troth, 2016; Fulop et al., 2018; Glińska-Neweś, Lis & Górka, 2016; Lei, Lehmann-Willenbrock & Chiu, 2013; Rowe, Hirsh & Anderson, 2007; Schmitz, De Rosa & Anderson, 2009; Wadlinger & Isaacowitz, 2006).

However, contradictory views have been offered. Some scholars have suggested that positivity within a team can be detrimental to innovation. For example, Lilienfeld and Arkowitz (2011) question the limitations of positive thinking and argued that too much positive thinking can be negative. Other empirical studies also shared a similar sentiment and cautioned that heightening or transferring positive spirits may potentially be more damaging in some cases (Norem, 2001; Tan & Forgas, 2010; Wood, Elaine Perunovic & Lee, 2009). Mitchell and Boyle (2019) conducted a study on 70 multidisciplinary healthcare teams in the United Kingdom and discovered that enhancing positive team moods increases the reliance on less effortful information processing that in return leads to undermining innovative potential. Misguided positivity can lead to too much cohesion that transpires to the groupthink phenomenon, which subsequently reduces the performance and innovativeness of the teams (Bernthal & Insko, 1993; Kakar & kumar Kakar, 2018; Rovio, Eskola, Kozub, Duda & Lintunen, 2009; Wise, 2014). Lastly, when channelled effectively, individuals can leverage negative emotions to fuel innovative sparks (Baas, De Dreu & Nijstad, 2011). It is owing to these discrepancies that this study intends to investigate the following hypothesis:

Hypothesis 18_o: *CI of a small team is positively affected by the cognitive-behaviours of transferring positivity.*

2.6.19 Hypothesis 19: Constructive conflicts

Studies reveal that having conflict within the team setting is unavoidable, but some types of conflicts may even enhance the innovativeness of the team (Costa et al., 2010; Hill et al.2014; Sinha et al., 2016; Roberson & Colquitt, 2005). For example, after examined how 82 research teams handle conflicts, (Costa, Passos and Bakker (2015) concluded that relationship conflicts weaken the team, but task conflicts can positively contribute to the relationship building within the team and increase team's performance. Paletz, Chan, and Schunn, (2017) also add that teams can leverage interpersonal micro conflicts to mitigate uncertainty and increase their design innovativeness after 21 engineering product design teams were studied.

But some scholars have debated and challenged the merit of task conflict (De Dreu et al., 2010; De Wit, Greer & Jehn, 2012; Lu, Zhou & Leung, 2011; Sinha, Janardhanan, Greer, Conlon & Edwards, 2016). For example, Khan et al. (2015) disagree with these findings and present the outcomes of their study which suggest that both task and relationship conflicts result in a considerably negative impact to the team performance of venture teams. Other empirical studies suggest that there is no meaningful relationship between team innovation and these three types of conflicts; task, relationship and process (Hülsheger, Anderson & Salgado, 2009; O'Neill, Allen & Hastings, 2013). Xie, Wang and Luan (2014) also present an inverted relationship between task conflict and team innovation.

Owing to this lack of consensus, theorists have been urging the research communities to probe the nuance of how task conflict shapes team dynamics and effectiveness (De Dreu et al., 2010). Despite all the aforementioned factors, it is imperative to note that the primary motive of this research is not to explore the nuances on the types of conflict affecting team innovativeness. This study investigates the extent to which conflict, friction, disagreement, or discord may impact the level of *CI* and subjected the following hypothesis for validation.

Hypothesis 19$_o$: CI of a small team is positively affected by the cognitive-behaviours of cultivating constructive conflict.

2.6.20 Hypothesis 20: Idea inclusivity

It is commonly acknowledged that the real value of teamwork resides in the team members' collaborative capabilities to draw from diverse perspectives and expertise to tackle complex problems (Love & Roper, 2009; Meslec, Aggarwal & Curseu, 2016; Thayer et al., 2018). Some studies additionally demonstrate that teams consisting of diverse functional backgrounds may benefit team performance owing to the fact that members of the team may possess a larger pool of experience and knowledge to draw from (Hofhuis et al., 2018; Horwitz & Horwitz, 2007).

However, other researchers have proposed a null or negative effect owing to the increase in team diversity (Bell, Villado, Lukasik, Belau & Briggs, 2011; Harvey, 2013; Østergaard, Timmermans & Kristinsson, 2011). The effect of task-diversity on team performance is not straight forward. (Hoisl, Gruber & Conti, 2017) show that diversity in task-related experience within the Formula 1 motorsport racing team exhibits inverse U-shaped relations with the team performance. Similarly, after having surveyed 167 health- and social-care teams in the Netherlands, Hofhuis, et al. (2018) reveal that in the absence of effective processes, team effectiveness is diminished by functional diversity. Other research also argues that an increase in functional diversity results in the decrease of team cohesion which subsequently negatively affects interpersonal communication that leads to the lowering of team performance (Bell, 2007; Hofhuis et al., 2018; Mello & Rentsch, 2015).

Scholars have called for a more-in-depth study to be conducted on the various multifaceted factors through which team diversity is said to influence team outcomes (Hülsheger et al., 2009); (Jackson & Joshi, 2011). Moreover, instead of focussing on the diversity, scholars have suggested that it is the inclusivity that has an mediating effect in enhancing team innovativeness and performance (Brimhall & Mor Barak, 2018; Harvey, 2017).

Team members' openness to experience has been suggested as a factor that positively attributes to innovativeness, creativity and performance (Guo, Su & Zhang, 2017). This study does not intend to underplay the importance of trust, communication and psychological affiliation with respect to team innovativeness (Boies, Fiset & Gill, 2015; Lyubovnikova, West, Dawson & West, 2018; Sanner & Bunderson, 2015). It merely aims to examine and assess the causality between team members' proclivity to include all members and team innovativeness and performance. This research therefore defines "idea inclusivity" as the cognitive-behaviours in which the team members embrace other members' ideas or suggestions in a constructive way. Hence, this research intends to investigate the following hypothesis:

Hypothesis 20_o: CI of a small team is positively affected by the cognitive-behaviours of including team members' ideas.

2.7 Action learning project teams

In recent years, leaders within organisations recognise the importance of renewing their management philosophies in an attempt to adapt to ever-increasing fierce competition within their operating environments (Dong, Wu & Zhang, 2019; Shan et al., 2016; Stayton & Mangematin, 2018). Implementing customised executive education (CEE) programmes has become a popular means for talent development in recent years as the design ethos of these programmes commonly aims at generating tangible return-on-investment for business, whilst providing real-life benefits (Anderson & van Wijk, 2010; Haskins & Shaffer, 2013).

Generally, delegates who attend a CEE programme have been selected by their line-managers in collaboration with the organisational learning division and only delegates with similar management rankings are invited to a specific programme. For example, a senior management development programme typically consists of delegates who hold the ranks of equivalent to a senior manager. All delegates organisational rankings were validated by the L&D Managers of their companies before they were invited to enrol for a specific CEE programme that matches their levels of seniority.

In addition, delegates in a CEE programme are typically assembled into small teams, and all teams are tasked to apply their learnings to tackle business opportunities of relevance to their organisations (Conine Jr & Peratoner, 2019; Robertson & Bell, 2017). Such an intervention is known as the "action learning" method. The action learning projects (ALPs) permit the delegates of the CEE programmes to immerse themselves in the real-life business challenges acutely and derive effective business concepts as collectives within a controlled environment (Day et al., 2014; Nicolini et al., 2003; Pedler, 2010). When properly designed, these pedagogically approved immersive experiences enable the delegates to bridge the knowing-doing gap and develop learning experiences that are emergent. Often the solutions developed from these challenges can be directly applied back to the corporates (Bakhtin, 2010; Schatzki, 1997).

Each ALP team will be assigned to or come up with a business project that is highly relevant to the current competitiveness and the future preparedness of the organisation. The ALP topics typically cover aspects of corporate entrepreneurship, organisational innovation, cost-saving and cultural improvement. All ALP teams are given a finite period of time to derive effective recommendations to a panel of judges, and it is fairly common that a small competition is held on the final day of the ALP journey to allow teams to compete against each other constructively. Usually, the panel of judges would consist of five or more subject matter experts and senior leaders from the companies that the delegates of the particular CEE programme are affiliated to. These panellists will go through the presentations and the written documents of all teams before adjudicating a winning team. As the number of panel members is sufficiently large, the final verdicts of the winning team are less affected by the biases of an individual panel member.

In addition, seeing that all ALP teams are competing with other ALP teams that consist of members with similar management seniority, assessing the behaviours of the ALP team members in such a controlled manner will reduce the disparity of the composition of the seniority and experience between teams in real-life situations. Furthermore, these topics have commonly received the endorsement by the senior leader. Thus, the approach using ALP competition to study *CI* potentially reduces the interference of organisational politics or the lack of support from top management.

2.8 Chapter conclusion

More empirical studies dedicated to the investigation of the existence of the factors affecting how small teams harness intelligence will be required (Aggarwal & Woolley, 2018; Mello & Rentsch, 2015; Vercammen et al., 2019; Woolley et al., 2010). As Kaur and Shah (2018, p. 535) stated, “the combined knowledge and expertise of a diverse team, has become the order of the day”, how leaders can assist their organisations to foster collective intelligence has become a very noteworthy topic in the era of the Fourth Industrial Revolution (Malone, 2018; McHugh et al., 2016). The effort to study this age-old concept must adopt a contemporary lens (Credé & Howardson, 2017; Kaur & Shah, 2018).

This chapter discussed the different themes of *CI* studies and argued the importance of studying *CI* of the small teams by highlighting its impact on organisations' performances and the contemporary management science findings. It also presented the gaps in the *CI* body of knowledge within the context of the level of small teams. The chapter then offers a working definition for the purpose of this study after having analysed several definitions and explanations offered by the scholar to date. The outcome of the analysis has influenced how the preliminary theoretical framework was constructed, and this study further argued that the *CI* of the team should be assessed from the perspective of three cognitive-behavioural clusters; "*Resource Acquisition and Utilisation*" (RAU), "*Strategic Thinking*" (ST) and "*Team-member Exchange*" (TMX). The hypotheses under each cluster to be subjected to empirical study were proposed. The complementary rationales behind studying them are also included in this chapter. Finally, this chapter deliberates the concept of ALP and its usefulness for this study.

CHAPTER 3: RESEARCH PHILOSOPHY AND METHODOLOGY

3.1 Introduction

Selecting the adequate research philosophy, design and techniques to aid an investigation is a critical but challenging component for any noteworthy research. This chapter presents the theoretical underpinnings and explanations of the research philosophy and research design adopted by this study. The research philosophy section will discuss the ontology, epistemology and axiology chosen by the researcher (Collis & Hussey, 2013; Saunders et al., 2007). Whereas the research design section presents the research rhetoric, procedures of the investigation and the overall tactics implemented to probe the research questions (Collis & Hussey, 2013; Leedy & Ormrod, 2010). This section shall also describe the rationales behind the selection of some research approaches, the research population and research sample. It will further articulate the choices made for the data collection as well as the statistical tools utilised for analysis and interpretation (Collis & Hussey, 2013; Mark Saunders et al., 2007). Subsequently, the ethics considerations and methodological limitations will be deliberated. Finally, this chapter will offer some concluding remarks. Figure 3.1 represents the flow and the key components of this chapter.

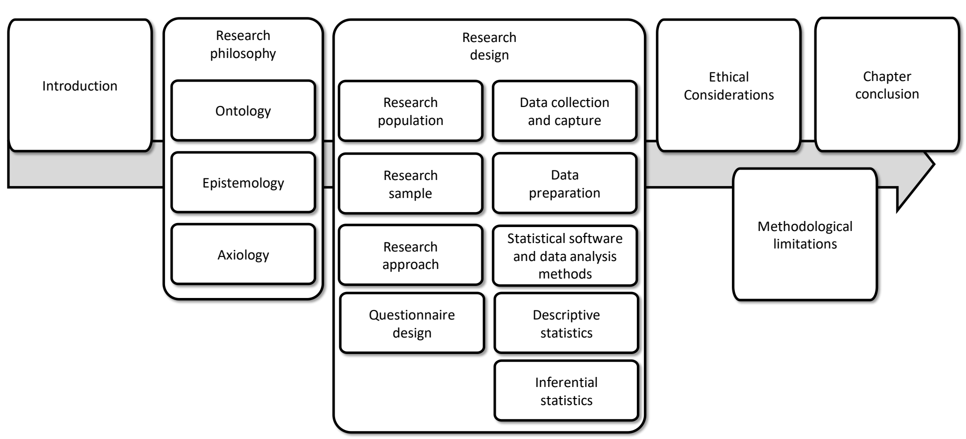

Figure 3.1. The flow and the key components of Chapter 3 (author's own)

3.2 Research philosophy

Research philosophy is the concern of how a phenomenon of interest should be best investigated in order for the study to make a meaningful contribution towards the development of knowledge in a relevant field (Leedy & Ormrod, 2010). It probes into the assumptions and the views deployed by the researcher during the knowledge development process (Johnson & Clark, 2006; Saunders et al., 2012). Commonly, research philosophies can be further classified into research ontology, research epistemology and research axiology (Johnson & Clark, 2006; Saunders et al., 2012). These key concepts, as well as, the stances adopted by the researcher for this study will be briefly outlined below.

3.2.1 Research ontology

Upon the commencement of the research process, clarifying the ontology of the research is of utmost importance, as it affects the overall research design (Leedy & Ormrod, 2010; Mark Saunders et al., 2007). Ontology can be defined as the philosophical concepts that describe the researcher's perception, beliefs and understandings of reality that are deployed for the investigation (Saunders et al., 2012).

This study adopts the objectivist ontology considering that objectivism argues that certain things or events, such as moral truths and scientific facts, exist irrespective of one's knowledge or perceptions of them (Collis & Hussey, 2013; Easterby-Smith, Thorpe & Jackson, 2012; Saunders et al., 2012). By adopting such ontological stance, it will provide this study with a firm foundation to objectively assess the relations between *CI* and cognitive-behaviours as well as ascertain which surveying method would be more suitable for *CI* related studies to be assessed objectively.

3.2.2 Research epistemology

Epistemology deals with the views of how knowledge is synthesised and what can be regarded as acceptable knowledge (Koskinen, Pihlanto & Vanharanta, 2003; Leedy & Ormrod, 2010). Easterby-Smith and co-authors (2012, p. 18) propose epistemology as “a general set of assumptions about ways of inquiring into the nature of the world”. Epistemology explores how the researcher justifies the knowledge gained as facts. Apart from probing into how a researcher obtained knowledge, it also encourages the researchers to explain the justified beliefs (Collis & Hussey, 2013; Easterby-Smith et al., 2012; Saunders et al., 2012). Through examining the possibilities, sources, methods, validity, scopes and limitations of knowledge in the field of study, epistemology enables the researcher to distinguish between truths and falsehoods (Cunningham & Fitzgerald, 1996; Saunders et al., 2012).

This study will leverage the authoritarian knowledge considering that the study entrusts information that has been obtained from appropriate authorities, such as journals, books, research articles, opinions of the subject matter experts and other legitimised sources of data (Cunningham & Fitzgerald, 1996; Saunders et al., 2012). It will rely on the knowledge generated from the thorough literature review process from Chapter 2 to develop the research hypotheses. Thereafter, the study relies on the inputs of the participants who took part in the ALP process. Based on these individuals’ experience, their inputs can be regarded as authoritative and logical.

Furthermore, this study assumes both the empirics and positivistic epistemological stances. Empiricism is an approach to gain knowledge by means of using empirical evidence through direct and indirect observation or experiencing the events of relevance to the research objectives. Whereas positivism regards the observable evidence as the only source of defendable scientific findings (Easterby-Smith et al., 2012; Mangan, Lalwani & Gardner, 2004); (Easterby-Smith et al., 2012; Mangan et al., 2004). These epistemological stances will allow the study to defend its intention to measure various cognitive-behavioural constructs and the outcome of the ALP process as well as to assess the relations between them. Through the empirical knowledge obtained from the data gathering and analysis, this study will analyse the data using trusted analytical tools to generate a set of findings and interpret the findings objectively based on the validated statistical methods.

3.2.3 Research axiology

The decision to adopt specific research approaches and investigation methods is in essence shaped by the researchers' assumptions about the knowledge and reality (E. Bell, Bryman & Harley, 2018; Easterby-Smith et al., 2012). Axiology explores the role of the researcher's own values, assumptions and worldviews across all phases of the investigation process. It describes how a particular study establishes and distinguishes between the correct and incorrect concepts relating to the research. It also contemplates the philosophical approaches of how the study makes the right decisions to evaluate, synthesise and validate value. (Lee & Lings, 2008).

This study adopts the research axiology that assumes the objectivity of the data obtained. The datasets are gathered then interpreted based on scientific methods proposed in Section 3.3 under the boundary of key research assumptions included in Section 1.7. The potential implications of the methodological limitations have been taken into consideration, and they will be discussed in Section 3.5.

3.3 Research design

Research design, also known as research strategy, outlines the feasible process that the researcher will endeavour to produce quality results, while systematically answering the research questions and contributing towards the knowledge development (Bell et al., 2018; Collis & Hussey, 2013; Saunders et al., 2012). It provides the overall tactical action plan that is practical, efficient, timeous, accurate and ethical when addressing the research objectives, whilst simultaneously taking the proposed ontology, epistemology and axiology into consideration (Saunders et al., 2012).

Other critical components in the research design are research population, research sample, research approach, data collection methods and data analysis methodology (Bell et al., 2018; Collis & Hussey, 2013; Saunders et al., 2012) the variations thereof. The following subsections will discuss the related theoretical underpinnings and the rationales behind the decisions made.

3.3.1 Research population

A research population can be regarded as the collection of individuals or objects known to have a set of similar binding characteristics or traits of relevance to the overall research objectives. The framing of the population units for any study will be dependent on the essence of the proposed research questions. A cross-sectional research survey is typically deployed to investigate what is happening in a sample group at a particular time so that the data collected can infer the same phenomena of the general population of relevance (Easterby-Smith et al., 2012; Krathwohl, 2009; Saunders et al., 2012).

This study regards the delegates who are involved in the ALP competition of different CCE programmes implemented by a business school in South Africa as the general population. Considering that all participants invited to take part in the surveying process hold common experiences of having gone through the ALP journey; this study assumes that all delegates possess the authoritarian knowledge to the research objectives. In addition, the delegates in the sample population for this study assume the ranks equivalent to middle and senior management, and they come from private sector corporates across different industries. The ranks of the delegates were validated by the L&D practitioners of their companies before they were invited to enrol for the programme. This study will assume the delegates enrolled for the respective middle and senior management development programme do hold the management rankings that genuinely reflect the level of the particular CEE programme implemented by the companies. This study avoided surveying junior staff members as an attempt to narrow down the sample populations so that the outcome of the study would not be skewed by other variables, such as the lack of experience.

3.3.2 Research sample

A sample is a collection of individuals or items that can represent a larger population from the social sciences and business research perspectives. As one cannot measure all individuals or items within a population, sampling specifies the conditions and guidelines of selecting the members or units of a population to partake in the research as the contributors of the primary data (Collis & Hussey, 2013; Saunders et al., 2012). The quality of sample screening process significantly impacts the success of the study as it affects whether the data gathered from the sample are generalisable. The ethos and the criteria underpinning the sampling guidelines further determine the reliability and validity of the study (Noar, 2003).

This study will be using the ALP team members of selected middle and senior management development CEE programmes as the research sample. Typically, a majority of the delegates did not know each other before enrolling in the programme. During the commencement of the ALP process, all delegates will be randomly assembled into small, informal and temporary teams. Therefore, by using ALP teams, the study can minimise how factors such as gender, ethnicity, ages and prior history affect the behaviours of the team members considering that these factors do not fall within the scope of this study. The rationales have been provided in Chapter 2.

All programmes targeted for the sampling process typically consisted of an ALP process that stretched for more than three months in the duration. This study avoided sampling the CEE programmes with a short ALP journey as the delegates would not have enough time to observe the proclivity of the cognitive-behaviours of themselves and their teammates and the data collected could be clouded by unnecessary cognitive-biases – such as the data availability bias. This selection criterion ensured that all ALP team members sampled had engaged with their team members several times in the team settings over several months.

Unfortunately, in reality, some delegates dropped out of their CEE programmes. It is important to mention that this study deliberately avoided surveying programmes with higher dropout rates after the ALP process had been carried out for a considerable period of time. The rationales behind such an approach are that these missing members could have impacted their ALP teams in ways that influenced the level of the *CI* before they dropped out. Therefore, without the input from these members, this study would reduce the defensibility of the research sample set. In addition, considering that any delegates who could not participate in the final day of the ALP process needed to submit a note to the programme management team, this study also obtained this valuable information from the programme management team just to avoid surveying programmes with significant absentees. The outcome of data analysis would not be as defensible if many members of the ALP teams were missing.

In addition, when the ALP judges of the programme decided to deem every syndicate as winners and were reluctant to make a distinction among the ALP teams or awarded multiple teams as joint winners, all datasets obtained under such conditions were discarded. This is due to the fact that the causality of the hypotheses and the outcome of the ALP competition cannot be empirically determined. Owing to these strict criteria, the data collection process of this study took almost three years to complete.

3.3.3 Research approach

The research approach describes the methods of choice, which the researcher deemed effective for the continuation of the study. The following sections will discuss the common research approaches, methodologies and the actual approach of this study.

Quasi-experiments are the empirical research methods that permit researchers to investigate the causality between the independent and dependent variables on the target population without the random assignment of research participants to orders of conditions. With the use of appropriate and use inferential statistical techniques, the quantitative data of the quasi-experiment can produce significant insights that imply and demonstrate the causality between the variables (Leonard & Marquardt, 2010). With the use of a cross-sectional survey, which collects data to infer about the general phenomena of a population of the interest of the study, the quasi-experimental designs are frequently adopted in the evaluation of educational interventions when random assignment is impractical or implausible (Gribbons & Herman, 1996). Several researchers have adopted the quasi-experimental design to assess the effectiveness of the action-based and discussion-based learning education methods. This research approach is, therefore, well-suited for this study considering that the unit of analysis is the individuals of the ALP teams and the individuals cannot be assigned to other variations of conditions.

3.3.3.1 Inductive, deductive and abductive approaches

Three common research approaches in the empirical research can be found, and they are known as the deductive, inductive and abductive approaches (Collis & Hussey, 2013; Saunders et al., 2012). These approaches can be deployed individually or in conjunction. They are as follows: (1) A deductive approach attempts to deduce conclusions from the existing premises or propositions and develop a hypothesis (or a set of hypotheses) based on an existing body of knowledge and proposes a systematic way of investigating the hypothesis (Collis & Hussey, 2013; Saunders et al., 2012), (2) an inductive approach begins with a question and consequently attempts to observe the situations of interest, seeks to uncover the patterns from these observations, justifies the hypotheses based on these patterns and formulates theories towards the end of the research process, and (3) an abductive approach is preferred when an investigation cannot be easily satisfied by either the deductive or inductive approaches or when the body of knowledge of a specific research field is not fully matured but can only be attended to by means of reasoning through successive approximation.

For the purpose of this study, a deductive approach was selected owing to that the study will investigate and determine the causality between twenty specific constructs and the level of *CI* in the ALP team. Seeing that the deductive approach tests the theories that were already publicised from the academic literature prior to the data collection, it will permit this research study to develop hypotheses or propositions associated with the existing theories (Saunders et al., 2012). Considering that these constructs have not been tested against *CI* before, the inductive and abductive approaches are deemed unhelpful. Furthermore, this study will also compare which one of the surveying methods, “Rate Self” or “Rate Team”, would be most suited for the purpose of studying *CI*. Hence the deductive approach was considered to the most appropriate approach.

As the measuring instrument consists of two items (“a” and “b”) per each of the 20 hypotheses and there are two surveying methods utilised, the coding of the datasets then followed this logic:

- H1a-RS: “H1a” = Item a of Hypothesis 1; “-RS” = “Rate Self” surveying approach
- H15b-RT: “H15b” = Item b of Hypothesis 15; “-RT” = “Rate Team” surveying approach

3.3.3.2 Quantitative and qualitative research methodologies

To support either the inductive, deductive or abductive approaches, a business or social science investigation generally adopt a quantitative or qualitative research methodology (Easterby-Smith et al., 2012; Saunders et al., 2012). In general, these two methods are deployed separately in a research. However, in some instances, both methods can be deployed to supplement each other to yield more prevailing conclusions (Bell et al., 2018; Krathwohl, 2009; Saunders et al., 2012).

The premise for quantitative research methods is to gain an understanding of natural phenomena by uncovering the relationships between variables in the said phenomena. Such methods accentuate the objectivity of the findings considering that data obtained via questionnaires, surveys, or other measurement techniques are subjected to a rigorous statistical, mathematical, or numerical scrutiny (Collis & Hussey, 2013; Easterby-Smith et al., 2012). In comparison, the ethos of qualitative research is based on continually categorising bits of data into similar themes and restructuring these themes to permit the emergence of meanings. The meanings of themes can be further analysed through the researcher’s perceptual filters to generate a holistic understanding of the research question(s). This further leads to the conceptualisation of the theoretical models and frameworks. Based on the richness of the data, the researcher can develop robust arguments, discussions and conclusions from a small sample size (Saunders et al., 2012).

The objectives of this study can be better achieved by deploying the quantitative research method. By conducting the study quantitatively, it allows the researcher the objectivity by being kept separate from the subjective interpretation of the data (Collis & Hussey, 2013; Easterby-Smith et al., 2012; Krathwohl, 2009). The quantitative method also supports the deductive positivist philosophical position (Bell et al., 2018; Saunders et al., 2012).

3.3.3.3 Research variables

A research variable is the item, which takes the form of an individual, object, or phenomenon that the study can measure empirically. Typically, two main classes of variables exist in a quantitative research: the instrumental and latent variables. The instrumental variables are generally deployed to ascertain the level of causality between the inputs and output of a survey in controlled experiments. Whereas the latent variables are the variables that cannot be directly observed by the study and they are inferred from other observable variables (Krathwohl, 2009; Noar, 2003; Saunders et al., 2012).

Within the category of instrumental variables, independent and dependent variables can be found. The independent variables are the set of constructs that are assumed to have a direct effect on one or more dependent variables, and a quantitative research method can thus validate the causality arising as the result of how independent variables affect the dependent variable(s).

The independent variables are the set of inputs that the researchers can control and alter. Whereas the dependent variables are the output of the experiment that is being measured owing to the effect of the independent variables (Krathwohl, 2009; Saunders et al., 2012).

As discussed in section 3.3.2, the research sample of this study will be the ALP team members of the selected middle and senior management development programmes. This study assumed that the winning team members collectively harness a higher degree of *CI* than the remaining teams. Considering that each ALP competition typically awards one winning team, it provides this study with a unique opportunity to examine the relations between team member's cognitive-behaviours and the outcome of the ALP competition when this study assigns these instrumental variables as such:

- Dependent variable = *winning* or *non-winning* teams (termed as "Win Only" and "Not Win" teams, respectively).
- Independent variables = 20 different cognitive-behaviours (Question items represent the 20 hypotheses stated in Chapter 2).

By means of assigning the above-stated variables, this study would be able to unravel both the existent and non-existent causal relationships between these cognitive-behavioural variables, which connect to the phenomenon of building *CI*. While the 20 hypotheses are the independent variables which can be measured, the three cognitive-behavioural clusters cannot be directly observed, and they are the latent variables of this study.

Apart from aiming to identify the key cognitive-behavioural qualities attributing to the level of *CI* in the ALP teams, this research also intends to test which of these two perceptions would be better suited for *CI* related investigations, two types of independent variables were collected so they could assess the same dependent variable again ("Win only" and "Not Win"). These independent variables are:

1) individual team member's perception over his/her own behaviours = Termed as "Rate Self" and denoted as "YOU" in the questionnaire (Found in Annexure A).

and

2) individual team members' perceptions over the general behaviours of the team as a whole, including their own behavioural contributions = Termed as "Rate Team" and denoted as "TEAM" in the questionnaire (Found in Annexure A).

The relationship between a latent variable and its item can be modelled as either reflective (effect indicator) or formative (cause or induced indicator) indicators (Byrne 2001; Hair et al. 2006). Based on the preliminary theoretical model proposed in Figure 2.2, this study made use of a recursive model owing to the fact that no latent variable acts as a cause and effect of another described latent variable. All items are modelled as formative indicators because they are viewed as the antecedent of dependent variables (Diamantopoulos & Siguaw 2006).

3.3.4 Questionnaire design

A questionnaire is often used in deductive quantitative research (Saunders et al., 2012). Ensuring that the questionnaire is of high quality is a crucial component of the overall research process.

Questionnaire design can be defined as a multistage process that ensures that the data obtained from the questionnaire can fully address the research questions regarding a particular phenomenon (Easterby-Smith et al., 2012; Saunders et al., 2012).

It is a common practice that in the absence of a validated instrument, the study can propose an instrument to aid the purpose of the study (Dawes, 2008; Noar, 2003; Saunders et al., 2012). As stated in Chapter 2, a comprehensive instrument that validates the cognitive-behaviours of team members leading to *CI* does not exist. Therefore, it is acceptable to make use of the theoretical constructs proposed to develop a questionnaire for this study. The following four steps were carried out (Sections 3.3.4.1 to 3.3.4.2).

3.3.4.1 Step 1: Formulating items

This step defines the constructs and the variables to be measured in accordance with Chapter 2 and Section 3.3.3.3. As previously stated, the 20 hypotheses are the independent instrumental variables, and the three cognitive-behavioural clusters are known as the latent variables. While latent variables cannot be directly observed, such challenge can be overcome by administering a multi-item instrument (Noar, 2003). When Dyer, Gregersen, and Christensen (2008) attempted to compare the cognitive-behaviours exercised by innovative entrepreneurs against those individuals who are less innovative and entrepreneurial, the relevant measuring scales for their research questions were not available. The co-authors, therefore, formulated their questionnaire items to assess a large sample of participants. This study followed a similar ethos when creating its questionnaire items.

The construction of the items avoided using unambiguous wording and compounded queries to reduce the interpretive errors of the participants (Easterby-Smith et al., 2012; Saunders et al., 2012). The only major difference is that instead of using the outcome of the ground research methods like Dyer, Gregersen, and Christensen (2008) did for their research, this study uses the knowledge gathered from Section 2.6.1 to 2.6.20 of the literature review chapter.

The question items as well as the alignment between the items and the research hypotheses are documented in Tables 3.1 and 3.2 below. Items take on a question form as if the researcher is directly questioning the research participants. Considering that one of the objectives of this study is to compare the outcomes of the two surveying approaches, the word(s) of “You” (referring to the participants) or “Your team members” (referring to participants’ respective team members) can be added in front of all question items listed in Tables in the final questionnaire. For example, for “Item a” of Cognitive-behaviour Hypothesis 1, the question for the “Rate Self” surveying approach will ask “You made an effort to obtained valuable inputs from senior management and/or executives” as stated in Table 3.1. Whereas the question for the “Rate Team” surveying approach will be “Your team members made an effort to obtained valuable inputs from senior management and/or executives” as the ones listed in Table 3.2. The alignment between the question items and hypotheses as well as the questionnaire can also be found in Annexure A.

Table 3.1 Questionnaire items used for the “Rate Self” surveying approach

Cognitive-behaviour hypothesis	Item a	Item b
1	You made an effort to obtained valuable inputs from senior management and/or executives.	You made an effort to get hold of valuable knowledge from senior management and/or executives.
2	You made an effort to connect with key employees from other unit(s) to gain valuable inputs.	You made an effort to gather helpful information from other units/teams inside the organisation.
3	You made an effort to obtain valuable information from key stakeholders from outside of the organisation, such as business partners, suppliers and/or subject matter experts, excluding the customers.	You made an effort to acquire the perspectives of relevant external stakeholders, such as business partners, suppliers and/or subject matter experts, excluding the customers.
4	You made an effort to gain different customers' inputs.	You made an effort to ensure that there is an adequate understanding of customers' perspectives.
5	You made an effort to leverage existing social capital to connect to more people who can provide beneficial information.	You made an effort to apply snowballing effect to link up with individuals who can provide valuable knowledge.
6	You made an effort to integrate all information acquired to benefit the ALP process.	You made an effort to prioritise which knowledge to integrate so that the ALP process can be benefited.
7	You made an effort to maintain the overarching intention of right from the initial phase of project without pivoting from it.	You made an effort to resist changing the high-level direction of project established by the team right from the beginning of the ALP journey.
8	You made an effort to ponder about various possible causal relations between the key elements and/or ideas that may affect the ALP.	You made an effort to exercise systems thinking in order to consider the challenge(s) holistically.
9	You made an effort to connect the past to the present to the future when attempting to solve the ALP challenge.	You made an effort to explore how certain future scenarios can be created by thinking about the gaps/opportunities in the present and the past.
10	You made an effort to piggyback off other existing endeavour(s) and/or trend(s) to benefit the progress of the ALP.	You made an effort to explore various plausible opportune ways to leverage other initiative(s) and/or individual(s) for the benefit of the ALP.
11	You made an effort to hypothesise different ways to tackle the ALP more effectively.	You made an effort to ask questions that are along these lines: "what if… then what would happen", and/or "why not try this way, because…".
12	You made an effort to reshape the goal and/or the next step of the ALP contextually.	You made an effort to adapt the way forward and/or to tackle the ALP based on the situation at hand.
13	You made an effort to confront own biases of relevance to the ALP.	You made an effort to challenge the current logics that exist in the industry and/or within the organisation.
14	You made an effort to reflect about the status of the ALP in an openminded way.	You made an effort to examine the reasons that transpire to the level/lack of progress made on the ALP honestly.
15	You made an effort to allow all team members took terms to lead the team well.	You made an effort to allow each other in the team to take on the leadership role.
16	You made an effort to hold yourself/themselves accountable based on the tasks assigned.	You made an effort to uphold your/their responsibilities.
17	You made an effort to keep on the timeline of delivery.	You made an effort to ensure the progress are on track.
18	You made an effort to uphold the positivity within the team.	You made an effort to transfer positivity among team members.
19	You made an effort to ensure the conflicts among the members are constructive.	You made an effort to channel the disagreements for the benefit of the ALP instead of becoming some level of interpersonal resentment.
20	You made an effort to welcome all ideas.	You made an effort to ensure individuals who generated the ideas felt acknowledged.

Table 3.2 Questionnaire items used for the "Rate Team" surveying approach

Cognitive-behaviour hypothesis	**Item a**	**Item b**
1	Your team members made an effort to obtained valuable inputs from senior management and/or executives.	Your team members made an effort to get hold of valuable knowledge from senior management and/or executives.
2	Your team members made an effort to connect with key employees from other unit(s) to gain valuable inputs.	Your team members made an effort to gather helpful information from other units/teams inside the organisation.
3	Your team members made an effort to obtain valuable information from key stakeholders from outside of the organisation, such as business partners, suppliers and/or subject matter experts, excluding the customers.	Your team members made an effort to acquire the perspectives of relevant external stakeholders, such as business partners, suppliers and/or subject matter experts, excluding the customers.
4	Your team members made an effort to gain different customers' inputs.	Your team members made an effort to ensure that there is an adequate understanding of customers' perspectives.
5	Your team members made an effort to leverage existing social capital to connect to more people who can provide beneficial information.	Your team members made an effort to apply snowballing effect to link up with individuals who can provide valuable knowledge.
6	Your team members made an effort to integrate all information acquired to benefit the ALP process.	Your team members made an effort to prioritise which knowledge to integrate so that the ALP process can be benefited.
7	Your team members made an effort to maintain the overarching intention of right from the initial phase of project without pivoting from it.	Your team members made an effort to resist changing the high-level direction of project established by the team right from the beginning of the ALP journey.
8	Your team members made an effort to ponder about various possible causal relations between the key elements and/or ideas that may affect the ALP.	Your team members made an effort to exercise systems thinking in order to consider the challenge(s) holistically.
9	Your team members made an effort to connect the past to the present to the future when attempting to solve the ALP challenge.	Your team members made an effort to explore how certain future scenarios can be created by thinking about the gaps/opportunities in the present and the past.
10	Your team members made an effort to piggyback off other existing endeavour(s) and/or trend(s) to benefit the progress of the ALP.	Your team members made an effort to explore various plausible opportune ways to leverage other initiative(s) and/or individual(s) for the benefit of the ALP.
11	Your team members made an effort to hypothesise different ways to tackle the ALP more effectively.	Your team members made an effort to ask questions that are along these lines: "what if… then what would happen", and/or "why not try this way, because…".
12	Your team members made an effort to reshape the goal and/or the next step of the ALP contextually.	Your team members made an effort to adapt the way forward and/or to tackle the ALP based on the situation at hand.
13	Your team members made an effort to confront own biases of relevance to the ALP.	Your team members made an effort to challenge the current logics that exist in the industry and/or within the organisation.
14	Your team members made an effort to reflect about the status of the ALP in an openminded way.	Your team members made an effort to examine the reasons that transpire to the level/lack of progress made on the ALP honestly.
15	You made an effort to allow all team members to take terms to lead the team well.	Your team members made an effort to allow each other to take on the leadership role.
16	Your team members made an effort to hold yourself/themselves accountable based on the tasks assigned.	Your team members made an effort to uphold your/their responsibilities.
17	Your team members made an effort to keep on the timeline of delivery.	Your team members made an effort to ensure the progress are on track.

18	Your team members made an effort to uphold the positivity within the team.	Your team members made an effort to transfer positivity among team members.
19	Your team members made an effort to ensure the conflicts among the members are constructive.	Your team members made an effort to channel the disagreements for the benefit of the ALP instead of becoming some level of interpersonal resentment.
20	Your team members made an effort to welcome all ideas.	Your team members made an effort to ensure individuals who generated the ideas felt acknowledged.

Aiming to maximise the response rate, the researcher took cognisance of the data collection circumstances. The questionnaire was kept concise on purpose. The study did not intend to keep ALP team members for too much longer after they had presented their findings to the judges (Boynton, 2004; Noar, 2003). Additionally, owing to the fact that this research does not intend to explore the differences between genders, ethnicity and nationality (as the rationales provided in Section 2.4.2), questions around personal attributes were omitted. By so doing, the length of the questionnaires was shortened and thus lessened the degree of inconvenience caused to the delegates. The survey design also deliberately kept the surveying items to only 40 questions.

3.3.4.2 Step 2: Measurement method

The method of data collection would be performed through soliciting the voluntary participation of the research sample, adhering to the ethics standard. The recommendations to maximise the response rate will be discussed in the next section. According to Boynton (2004, p. 1373), "The choice of how to administer a questionnaire is too often made on convenience or cost grounds. Scientific and ethical considerations should include the needs and preferences of participants, who should understand what is required of them; remain interested and cooperative throughout completion; be asked the right questions and have their responses recorded accurately; and receive appropriate support during and after completing the questionnaire”. This recommendation was also taken into consideration.

The scale of the surveying instrument is important. Some scholars suggested that using a 7-point scoring scale showed a smaller benefit compared to a 5-point scoring scale owing to the slight increase in the variance of the measurement (Burns & Bush, 2010). However, some other research suggested that the difference is minimal (Lissitz & Green, 1975). Nonetheless, it is commonly accepted that there is a diminishing return to use higher points scales (Dawes, 2008). Scholars have also cautioned against the use of even-numbered scoring scales. They propose that even-numbered scoring scales do not allow individuals with neutral views towards a particular question(s) to choose a category that genuinely denotes their opinion(s) and thus increase the inaccuracy of the research (Dawes, 2008; Saunders et al., 2012). Based on these recommendations, a 7-point scoring scale was adopted by this study. The participants of the research were invited to rate their responses along with a score range of seven points, from strongly disagree (score 1) to disagree and somewhat disagree (2 and 3, respective); to neutral (4); somewhat agree (5); agree (6); and strongly agree (7) (Boynton, 2004; Noar, 2003).

Each ALP team member was given the opportunity to rate the proclivity of his or her cognitive-behaviours as well as the proclivity of his or her team members’ collective cognitive-behaviours. After having consulted with key stakeholders, the L&D managers, programme managers and former delegates, the most opportune time to administer the questionnaire was deemed to be in between the time shortly after all ALP teams had presented their work to the panel and before they learned about the outcome of the competition. It is agreed that by so doing, it would give the participants the chance to fully immerse the ALP process so that they could have the most appropriate knowledge to complete the questionnaire, yet without their perceptions being skewed by hindsight biases after they learned about the outcomes of the competition. Moreover, this time slot was regarded as the most suitable time as the participants' memories would still be fresh.

These key stakeholders further pointed out that from the practical stance, the delegates would be in a more relaxed state of mind to complete the questionnaire after all of them had delivered their presentations and written documents to the panel of judges. Surveying the delegates shortly before they are about to interact with the panel of judging would not lead to the desired outcome considering that the delegates would be focusing on their final ALP hurdle. Furthermore, they could potentially be anxious and surveying their perceptions under such circumstance could potentially affect the accuracy of their responses or result in a lower response rate or both. (The emotions of the delegates had been listed as a methodological limitation in section 3.5).

3.3.4.3 Step 3: Pilot study

It is recommended to conduct a pilot test to assess the comprehensibility, relevance, and viability of the measurement instrument (Boynton, 2004; Noar, 2003). As stated by (Noar, 2003), p. 626), "Once an initial item pool has been developed, it should be reviewed by a set of expert reviewers to ensure content validity. Very often this is done by colleagues who have some knowledge of the area. It is also a good idea to have individuals who have no knowledge of the specific area fill out and examine the scale, as participants filling out the scale for the first time may be in a similar situation”. The pre-testing of the questionnaire was conducted with a small group of individuals consisting of former delegates who had taken part in the ALP process. These individuals held appropriate knowledge and shared the same attributes with the individuals this study intended to sample. In general, it took an individual less than 12 minutes (about 7 to 11 minutes) to complete the questionnaire items.

3.3.4.4 Step 4: Field test

It is crucial to conduct the field test to ensure some of the challenges relevant to administering the questionnaire could be lessened or eradicated. Despite that it has been suggested using online survey tools could increase the response rate (Boynton, 2004), the first two trial runs of the surveying process demonstrated that administering the digital surveying process was unsuitable for this study. It was found that some delegates were unable to log on to the online surveying portal due to challenges of their electronic devices (i.e. cellphone or tablet ran out of battery) even though they could access the digital questionnaire via free Wi-Fi. The surveying completion rate significantly improved when each of the ALP delegates received a pen and the paper-based questionnaire. Using the paper-based surveying method also reduced the duration of the surveying time as the majority of the delegates had switched off or packed away their electronic devices shortly before they present their business concepts to the judges, and it took a longer time for them to initiate the surveying process.

3.3.5 Data collection and capture

Data collection and capture are the systematic processes of selecting and harvesting information of relevance to the variables representing the research questions of interest (Saunders et al., 2012). These processes will generate information that enables the researchers to test hypotheses, evaluate outcomes and generate insights pertaining to the research questions (Saunders et al., 2012). Hence, the research design must contemplate the best ways to collect and capture data in order to permit meaningful, justifiable analyses. The practical choices made by the researchers on how the research data are harvested ethically should also be documented (Bell et al., 2018; Collis & Hussey, 2013; Saunders et al., 2012).

Data that is conducted through survey-based business research often contains large amounts of raw data, thus requiring in-depth editing, sorting, coding and mathematical calculation, and subsequently, such data is best analysed via computer. It is imperative that this raw data be thoroughly edited. Then it must go through coding and must have no errors before conducting any statistical analysis. These exhaustive checks are conducted to ensure that the data is free of any inconsistencies and errors before it is transferred to the data storage processes (Tabachnick & Fidell, 2001).

Prior to conducting data collection, the researcher first obtained permission from the L&D Managers of the companies sponsoring the CEE programmes and the Programme Managers of the business school who were in charge of the coordination. Considering that it is costumery for delegates of these management development programmes to complete a lengthy programme quality evaluation survey after every study block when a CEE programme consisted of several study blocks over three months or more, the delegates become accustomed to completing surveys. In addition, seeing that the CEE programmes do request the delegate to complete a programme quality survey on the final day of the ALP competition, the stakeholders suggested that it could be an opportunity for this study to introduce the questionnaire. The data collection timeslot was deemed most appropriate to take place shortly after the ALP teams had completed their presentations as the judges spend time deliberating the final results, but before they learned about their final results. As judges generally took about 30 to 60 minutes to adjudicate the winner of an ALP competition, this gap would give the delegates sufficient time to complete the questionnaire since the surveying process could be concluded in 12 minutes or less. Since there were tea-breaks throughout the final day, and all delegates could take comfort breaks while other ALP teams were delivering their presentations, the request to complete the questionnaire was not met with negativity. The delegates were supportive in general.

All ALP team members were notified that participation in this research is on a voluntary basis before administering the data collection process, and some delegates had exercised this right. In an attempt to increase the response rate ethically, this study adopted various practical tips proposed by the article titled, “Hands-on guide to questionnaire research. Administering, analysing, and reporting your questionnaire”, published in the British Medical Journal (impact factor (2019) = 30.223 (Scimagojr, 2020)) (Boynton, 2004). Specifically, the following recommendations were modified and adopted by this study (Boynton, 2004, p. 1373):

- “Participants are notified about the study in advance with a personalised invitation.” (Despite that each delegate did not receive a personalised invitation, the researcher personally invited all delegates to take part in the survey process when the schedule of the final day of the ALP competition was presented to the delegates.)

- “The aim of study and means of completing the questionnaire are clearly explained.” (Before administering the survey, the researcher explained the significance of this activity and explained the questionnaire. The significant implication of unanswered items was also clearly articulated to the participants. The reason for using pen and paper surveying format to reduce delegates’ inconvenience was discussed.)

- “A researcher is available to answer questions and collect the completed questionnaire.” (As all delegates have just gone through a few months of business education, all terms included on the questionnaire items are familiar to them. To minimise potential confusion, the researcher informed all participants to raise any query with him, and the researcher was on standby ready to address any queries.)

- “The participant feels they are a stakeholder in the study”. (The novelty of this study was conveyed to the participant. The difficulty in collecting the data was also articulated. Furthermore, as the outcome of the research would permit all companies and business schools to refine the ALP process and education content, the direct benefits of this study to their companies and future delegates were also succinctly explained to the delegates.)

- “Questions are phrased in a way that holds the participant’s attention” and “Questionnaire has clear focus and purpose and kept concise” (The questions used popular business terms that were covered in the business education. The wording and the style of questions were kept concise and only 40 items were proposed. It is to ensure the delegates would not feel that it required too much effort for them to respond to the questionnaire)

- Boynton (2004) further suggested that the researcher should monitor the research data collection process and find ethical means to improve the way to introduce the research or seek consent. (There was one case where a syndicate member was unable to attend the final day of the ALP presentation. The researcher invited this delegate to complete the questionnaire on a voluntary basis. In an attempt to reduce the non-response for items as the result of carelessness of the delegates, the researcher immediately glanced through each script and sorted the responses according to the syndicates after the delegates completed the survey. However, if a delegate declined to participate in the surveying process, the right for refusal was observed and respected.)

The study initially considered 39 CEE programmes. However, not all programmes met the selection criteria stated in Section 3.3.2. In total, the questionnaire was only presented to 745 delegates from 20 CEE programmes. After filtering through the survey responses based on the criteria stated in the previous sections, only 406 delegates from 12 programmes were selected as the dataset for this study. The usable datasets represent 54.50% of the total number of delegates invited to take part in this study. This response rate is deemed acceptable when compared to the typical response rates of the research studies conducted at the organisational level (Baruch & Holtom 2008).

3.3.6 Data preparation

Preparing the raw data into a format that is well-suited for the desired statistical evaluation procedures is considered to be a crucial step for all quantitative research. Before any data is analysed, it is imperative that the raw data from which it is sourced undergoes rigorous and thorough checks for any errors (Cooper & Schindler 2003). Data preparation enabled the researcher to check for the following; data omission, reliability, and validity. This is a mandatory step before any study continues with the data analyses (Hair et al. 2006).

All responses from the companies involved were anonymised and stored in a secure location. The responses from the participants were transferred from paper-based surveys into the digital format using an excel spreadsheet. The data transferring process was double-checked by the researcher to ensure that the data captured for every survey script matched those figures tabulated in all rows and columns of the spreadsheet. The process of transferring data was conducted by the researcher and checked by a research assistant to eradicate human error. Though it was a time-consuming step, it was also a crucial one. An assistant was recruited to ensure all datasets were captured effectively.

Missing data value could affect the outcome of the investigation. There are various ways of managing the potential problems that may arise from missing values, such as estimating over subjective ranges, extrapolating and adjusting accordingly, and various other techniques (Hair Jr, 206). However, none of these techniques was deemed suitable for this study, considering that one of the main objectives is to investigate team members' perceptions of the collective behaviours of the team. Hence, the data set obtained from some of the CEE programmes were discarded, and only 54.50% of the total sample was used for this study.

3.3.7 Statistical software programme and data analysis methods

It is crucial to select the appropriate statistical software programs which are suitable for descriptive and inferential statistical analyses, which enable the researcher to critically analyse the data obtained against the research questions and the hypothesised conceptual model (Barclay, Higgins & Thompson 1995; Tabachnick & Fidell, 2001). The statistical software packages deployed for this research are; SPSS 25.0.0.0 and SmartPLS 3.2.8.

Data analysis is a process of systematically applying statistical techniques to examine, integrate, condense, compute and evaluate data with the aim of uncovering useful patterns to hold informed discussions and to draw conclusive remarks. For quantitative studies, the data analysis process makes use of the data to provide quantifiable and objective findings that can be easily interpreted without a high degree of ambiguity (Collis & Hussey, 2013; Easterby-Smith et al., 2012; Saunders et al., 2012). As a majority of the quantitative studies attempt to eradicate or significantly reduce the personal bias of the research impacting the data, these findings obtained can be defensible when researchers attempt to generalise their meanings and extrapolate them to the greater population (Collis & Hussey, 2013; Easterby-Smith et al., 2012; Saunders et al., 2012). The following subsections shall briefly describe the descriptive and inferential statistical analyses selected for this study.

3.3.8 Descriptive statistics

Descriptive statistics analyse and summarise the basic patterns of the data collected from the sample. The measures deployed in this process provide valuable knowledge of the dataset such as frequency distribution, dispersion and general shape. The techniques also provide the means, medians, modes, standard deviations, and error checking (Saunders et al., 2012). Furthermore, it is imperative to note that to arrange data in a table format successfully, one is required to use cross-tabulation, as it helps the researcher to gain insight into the frequency of particular responses. It must be noted that in this process, descriptive statistics are useful means of gaining a clearer understanding of data. However, they are not appropriate for providing useful information on the multiple relationships between variables (Saunders et al., 2012)

3.3.8.1 Basic analyses

Pending the nature of the investigation, these descriptions may become the basis of a more comprehensive statistical analysis or a means of providing sufficient insights (Saunders et al., 2012). The definitions of the helpful techniques deployed in this study are listed below:

- *Mean* – the numerical average from the total summation of a particular variable of the data set.

- *Minimum and maximum values* – the highest and lowest values or scores for any particular variable of the data set.

- *Range* – the difference between the minimum and maximum values as stated above.

- *Standard deviation* – how far apart all the numbers are in a set.

3.3.8.2 Normality, skewness and kurtosis

A normality test is a statistical procedure deployed to evaluate whether a sample set indeed fits a standard normal distribution. It examines if the sample data has been drawn from a normally distributed population within a pre-determined tolerance level (Collis & Hussey, 2013; Easterby-Smith et al., 2012; Saunders et al., 2012). For this study, it is necessary to assess the normality of data. The outcome of the test will indicate whether the nature of the data distribution is parametric or non-parametric, thus helping the researcher to make an informed decision for the deployment of the subsequent tests, which the research is based on. The distributions of the normality of the datasets with interval and ratio scales should be investigated to understand if the data fits into a normal bell shape (Saunders et al., 2012). The aforementioned normality of distributions was performed by calculating the values of skew and kurtosis for the distribution of scores for the data.

Skewness is a measure of the *asymmetry* probability of the data distribution about its mean. The skewness value indicates that the shape of the curves is either non-asymmetric (by positive or negative figure) or asymmetric (undefined). A negative skew figure suggests that more samples are distributed on the left side of the tail, whereas a negative skew figure suggests that the right tail is longer (Collis & Hussey 2009; Pallant 2011).

Kurtosis measures the "tailed-ness" of the probability distribution. The sharpness of the peak of a frequency-distribution curve is proportional to the value of the kurtosis. Kurtosis values reflect the samples to be either “leptokurtic” – data more concentrated about the mean and the curve quickly decreases away from the mean resulting in thin tails, “mesokurtic” – a normal distribution or “platykurtic” – as opposed to “leptokurtic” (Collis & Hussey, 2013; Easterby-Smith et al., 2012; Saunders et al., 2012). West, Finch and Curran (1995) posit the threshold of greater than 2.1 as the skewness value that indicates the curve has substantially deviated from the normality.

To evaluate whatever the distribution’s skewness deviated substantially from the normal distribution, the score is less than -1 or greater than 1. The values of either between -1 and -0.5 or between 0.5 and 1, indicate that the distribution is moderately skewed. If a skewness score falls within the range between -0.5 and 0.5, the distribution is approximately symmetric (Tabachnick & Fidell, 2001). Whereas for kurtosis, West et al. (1996) suggest that any value of greater than 7.1 indicates that there is a substantial departure from normality.

3.4.8.3 Reliability and validity

Prior to conducting factor analyses, one is required to establish internal reliability by evaluating the accuracy of the measurement items. Reliability refers to the consistency of the research findings that are repeatable, and validity refers to the extent of the accuracy of the presented research findings (Saunders et al., 2009).

The main objectives of checking the reliability among the items under the same factors are to ensure that the data of the items describing similar factors do not exhibit significant dissimilarities if it was collected from the same participants (Saunders et al., 2012). For each factor, the research design includes two items to validate the internal consistency measures in order to be able to assess reliability. Though the questions asked were *not* identical, they were aligned on the same general idea. Admittedly, it would have been ideal to introduce more items per hypothesis. However, as the delegates had just completed their presentations to the judges, it is crucial to keep the questionnaire as concise as possible to increase the completion rate. This tactic is in accordance with the recommendations made by Boynton (2004).

Owing to two key objectives of this research; comparing which cognitive-behavioural factors affect *CI* more significantly and which surveying method, "Rate Self" and "Rate Team" can be a better predictor of *CI*, two types of calculations were conducted:

1. **Intra-factor variety reliability:** Assessing the two items, both scored by the same rating method, that account for one particular hypothesis. In other words, for Hypothesis 1, the validity between H1a-RS and H1b-RS was computed and examined. Thereafter, for

Hypothesis 1, the validity between H2a-RS was computed and examined, and so forth. Once the validity calculation for all datasets was obtained from the "Rate Self" surveying approach, the datasets obtained from the "Rate Team" scoring method were subjected to the same validity test. The findings from this validity calculation examine whether the two items of the same hypothesis are consistent with each other.

2. **Different scoring methods reliability:** Assessing the validity by comparing the same item but scored by different scoring methods. For example, H1a-RS and H1a-RT were subjected to the validity test. Thereafter, H1b-RS and H1b-RT were subjected to the same test and so forth. This exercise will reveal if the datasets obtained from the "Rate Self" surveying approach differ from those respective datasets obtained from the "Rate Team" surveying approach. It will provide a preliminary understanding of whether the two surveying methods obtained similar data or not.

3. **Group-based reliability:** Two different groups were assigned based on the outcome of the ALP competition, the "Win Only" and "Not Win" groups. Calculating such group-based validity of the datasets of the two groups can further provide the researchers with insights into the degree of similarity between these groups.

The Cronbach's Alpha has been used to test the internal consistency of the survey items as it is the most commonly accepted measurement (Collis & Hussey, 2013; Hair, Black, Babin, Anderson & Tatham, 2006; Saunders et al., 2012; Tabachnick & Fidell, 2001). A high value of Cronbach's

Alpha indicates good internal consistency between the items investigated. Generally, Cronbach's Alpha threshold can be interpreted as excellent ($\alpha > 0.9$); good ($0.899 > \alpha > 0.8$); acceptable ($0.799 > \alpha > 0.7$); questionable ($0.699 > \alpha > 0.6$); poor ($0.599 > \alpha > 0.5$) or unacceptable ($\alpha > 0.5$) (Mallery & George, 2003). Even though several versions of interpretation of threshold range have been proposed (Chin, 1998; (Hair et al., 2006; Mallery & George, 2003), the interpretation of the value can be flexible. A value higher than 0.60 level is also adequate when additional items are added in the block or other questions measuring the same factor have high reliability scores (Barclay, Higgins & Thompson 1995; Chin, 1998).

3.4.8.4 Outliers

In statistics, an outlier is a data point that significantly differs from other observations. The occurrence number of outliers can be problematic in statistical analyses. They are also known to indicate that the population has a heavy-tailed distribution. One has to heavily deliberate the decision to omit or incorporate the outliers (Saunders et al., 2012). How this study treats its outlier data points and the significance of these points will be discussed more in detail in Chapter 4.

3.3.9 Inferential statistics

In order to address specific research questions when adopting a quantitative method, the researcher may wish to uncover the underlying characteristics that are unclear regarding the direct observation or measurement. Inferential statistics are deployed to assist researchers to move beyond simple descriptions or characterisations of the data obtained (Chin, 1998). Such underlying characteristics may expose relationships that describe how some variables are tightly correlated with each other but loosely correlated with others ((Hair et al., 2006; Tabachnick & Fidell, 2001). To obtain accurate sample information, one must first explore and then confirm the underlying dimensionality of a probability distribution and test the relationship between the measured items (Jolliffe & Cadima, 2016). Factor analysis is thus described as a statistical correlational method that ascertains the underlying grouping of measured items with shared variability and categorises them in the same dimension, also known as factor (Hair et al., 2006; Tabachnick & Fidell, 2001).

3.3.9.1 Exploratory and confirmatory factor analysis techniques

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) techniques are the two factor analysis techniques that permit the researcher to uncover and validate the hidden structure of the manifest variables with similar characteristics. This information can subsequently be utilised to reduce the dimensionality of a set of hypotheses (Collis & Hussey, 2013; Easterby-Smith et al., 2012; Saunders et al., 2012).

Exploratory factor analysis (EFA) is a variable reduction multivariate technique usually utilised on an a-priori theoretical basis. It serves to assist the researcher to hypothesise the number of underlying structure (dimensionality of factor(s)) in a dataset without imposing any predetermined structure on the outcome (Jolliffe & Cadima, 2016)**.** The technique assumes that any measured variable can readily associate with other variables or any factor. It is an essential pre-requisite step before deploying the CFA (Hair et al., 2006; Tabachnick & Fidell, 2001). By applying the principal components analysis technique in the beginning, it enables the technique to extract as many observed variables of the total variance as possible. EFA serves a double objective of bringing about data consolidation and condenses them based on whether common dimensionality exists between factors (Hair et al., 2009).

CFA can be applied in conjunction with EFA. This technique assists researchers to confirm or reject the underlying structure (dimensionality of factor(s)) assigned to the phenomena uncovered by EFA (Hair et al., 2006; Tabachnick & Fidell, 2001). It is a component variance-based approach that imposes the constraints uncovered by EFA on the dataset and thereafter, develops a set of *a priori* hypotheses (Jolliffe & Cadima, 2016). This method can measure how well or how poor the proposed model captured the covariance between all the variables, leading to the choice to either accept or reject the model (Hair et al., 2006; Tabachnick & Fidell, 2001). The outcome of the CFA calculation will reveal whether or not the set of items falls into the respective dimensions as proposed in EFA (Hair et al., 2006).

This study also deployed the CFA, followed by a varimax rotation to evaluate the underlying data pattern of the three cognitive-behavioural clusters for the datasets obtained from both surveying methods. The findings of the CFA were leveraged as the basis of constructing the preliminary theoretical frameworks accounted for the “Rate Self” and “Rate Team” surveying approaches.

3.3.9.2 Common method biases

Common method bias, also known as common method variance, is one of the main concerns found in studies that utilise single-source, self-report and cross-sectional designs. Common method bias is defined as “variance that is attributed to the measurement method rather than to the constructs the measures represent” (Podsakoff et al. 2003, p.879). Considering that this study collected data from various single respondents using the same survey questionnaire (i.e. through self-reporting) and during the same time period (i.e. cross-sectional research design), there may be a risk of common method bias presented in the dataset.

3.3.9.3 Known group validity

Known group method can be deployed to validate construct validity and to ascertain if a group of individuals exhibit certain characteristic differently than another group. It is an inferential statistical technique that assesses the test’s ability to differentiate the groups based on the groups demonstrating different mean scores on the test. Typically, the independent samplest-test is utilised to determine the significance of the difference between the means of two groups. A larger the t score indicates the there is a more significant difference between groups. A smaller the t score suggests that there is a higher similarity between groups (Hair et al., 2006).

3.3.9.4 Reliability of the factors

Before one can proceed with the structural equation modelling (SEM), as intended by this study, the reliability and validity assessment should be performed in order to ensure that the factors extracted are valid and reliable. As discussed in the previous sections, reliability is used to determine whether or not the factors derived from factor analyses can be confidently used. Reliability tests associated with factor analysis procedures typically examine intrinsic reliability and composite reliability (Chin, 1998). Cronbach`s Alpha reliability coefficients, a test to study intrinsic consistency, are ranged between 0 and 1, and a high value of alpha reveals that there is a good internal consistency of the items.

Other useful intrinsic reliability tests, the Kaiser-Meyer-Olkin (KMO) Test for Sampling Adequacy and the Bartlett's Test of Sphericity, attempt to determine how suitable the data is for factor analysis. (Hair et al., 2006). Any KMO values more than 0.6 signify that sampling is adequate, providing that the p-value is lower than 0.05 (Hair et al., 2006).

A chi square (χ^2) statistic is a versatile statistical assessment technique that can be deployed to test the significance of relationships between variables. It measures how expectations compare to actual observed data. The suggested acceptable value for relative chi-square, (CMIN/DF), should be between 1 to 5, which is used to reduce dependency on sample size. However, CMIN/df should not be really relied upon in cases involving large samples, and scholars have suggested ignoring this measurement (Schermelleh-Engel, Moosbrugger & Müller, 2003; Vandenberg, 2006).

Constructs reliability, the extent to which a test assesses what it claims, is generally carried out during the investigation (Chin, 1998). Measuring the relationships between factors and their respective correlating items can indicate how closely they are corresponding with the theoretical concepts (Barclay, Higgins & Thompson 1995). Individual construct/item reliability identifies the standardised loadings that measure the relationship between observed variables and correlating unobserved variables. It reflects the internal consistency in scale items. The item loading threshold for acceptance is 0.7 (Hulland, 1999), but loading can be lower when the measurement model is tested in a different context (Barclay, Higgins & Thompson 1995). Some scholars suggest that a composite reliability value above 0.6 and below 0.9 can be deemed acceptable. Any value higher than 0.9 implies there is a redundancy between the measured items (Hair et al., 2006).

Composite reliability is an alternative measure because a coefficient alpha may over or underestimate scale reliability. A value of composite reliability index (CRI) above 0.7 suggests the suitability of the model (Hair et al., 2006; Mallery & George, 2003). However, there is a lack of consensus regarding the thresholds for CRI. Some scholars suggest that a CRI value above 0.6 and below 0.9 can be deemed acceptable (Hair et al., 2006). Any value higher than 0.9 implies the redundancy between the measured items (Hair et al., 2006).

3.3.9.5 Validity of the factors

Validity evaluates whether the instrument indeed measures what it is required to measure. The convergent validity explores coherency levels of the measurement across items within a factor, whilst on the other hand, discriminant validity looks at the measurement of each factor distinctly different from each other (Barclay, Higgins & Thompson 1995; Fornell & Larcker, 1981).

Evaluating communality represents one of the methods for a convergent validity test. It is a squared variance-accounted-for statistic that represents the degree in which the measured variables have been reproduced by the latent constructs. The value reflects the common variance that would be shared by factors with given variables. Scholars have suggested that an average variance extracted (AVE) value of 0.50 or more can be deemed to be the most suitable because the factors explain at least 50% variance of measurements (Fornell & Larcker, 1981; Hair et al., 2006). However, in special cases, when the Composite Reliability Index (CRI) is high, the AVE value of above 0.4 can be accepted (Fornell & Larcker, 1981).

Discriminant validity requires that the square root of the AVE for a given variable be greater than any correlation among any pair of constructs (O'Leary-Kelly & J. Vokurka, 1998). Factor analysis procedures require one to examine the AVE values. AVE measures the amount of variance within the dataset captured by a factor in relation to the total amount of variance (Rogness, Stephenson, Stephenson & Moore, 2002). The acceptable AVE value threshold is generally set above 0.5 (Hair et al., 2006), though it is not always the case. A lower value (between 0.0-0.4) implies that variables may find it difficult to significantly cross-load with other items (Hair et al., 2006). In specific cases such as when the construct reliability values are high, the AVE value of above 0.4 can be accepted (Fornell & Larcker, 1981). Other scholars have proposed that the communalities of above 0.4 can be deemed acceptable when using Principal Axis Factoring with rotation (Osborne, Costello & Kellow, 2008).

3.3.9.6 Partial least squares – structural equation modelling technique

After having explored and confirmed the dimensionality within the dataset, it is useful to test the hypotheses as well as the conceptual models regarding the hypothesised causal relationships between dependent and independent variables (Tabachnick & Fidell, 2001). Structural equation modelling (SEM) is a useful causal modelling technique, and it is often the preferred approach when it comes to studying social sciences related phenomena. This is in part owing to this procedure's ability to describe relationships between the unobserved constructs (also known as latent variables) from measured items (Hair et al., 2006).

Instead of conducting a regression analysis after the CFA to ascertain the causality between independent and dependent variables, SEM is known to be a more robust approach (Hair et al., 2006). The structural model estimates using the second-generation techniques to evaluate more than one layer of associations between independent, latent and dependent variables by applying prediction-oriented measures concurrently. The inner part of the model describes the hypothesised directional relationships between measured items and latent variables, and subsequently quantifies the magnitude of the association (Barclay, Higgins & Thompson 1995; Tabachnick & Fidell, 2001). The structural inner model can ascertain the mediated prediction of latent variables on to another dependent latent variable, which in turn predicts another dependent latent variable. To increase the accuracy when estimating the parameters in the inner structural model for this research, a bootstrapping procedure with 300 re-samples can be implemented to assess the significance of quality of the estimated structural model parameters and the effect of each causal path (Barclay, Higgins & Thompson 1995; Hair Jr, 2016).

Increasingly, researchers from various disciplines are using the Partial Least Squares (PLS) modelling technique to validate their research questions when applying SEM (Hulland 1999; Vieites & Calvo 2011; Hoyer, 2004; Tenenhaus et al. 2005). Utilising the PLS technique to supplement traditional SEM has various advantages (Fornell & Cha 1994; Chin 1998a; Hair et al. 2006). One of them being that PLS-SEM technique studies all variables synchronously, it is thus capable of providing a more superior predictive accuracy (Clark & Cramer III, 1993); Hair Jr, 2016). It can also effectively identify actual paths without falsely identifying non-existent paths. However, the accuracy of PLS-SEM calculation does suffer when the sample size is small. However, considering that this research managed to obtain the responses from a relatively vast number of participants, these limitations will not be detrimental. Moreover, this technique is also known to produce good results even when the datasets are non-normality in their nature – as the datasets of this study, which will be discussed in Chapter 4 (Barclay, Higgins & Thompson 1995; Chin 1998). The robust technique applies bootstrapping methods to examine the standard errors when testing the research hypotheses. This random sampling with replacement technique further enables the study to work with assignment measures with higher accuracy (Hulland 1999; Hair Jr, 2016).

In the case of this study, the paths for causality and the types of variables will be clearly defined after the EFA/CFA calculations, and the theoretical framework established will be suited for the SEM-PLS calculation. The relatively large data size will also increase the robustness of the PLS-SEM technique (Chin & Newsted 1999).

3.3.9.7 Model fit

The quality of the conceptual models has to be inspected using a number of Goodness-of-fit (GoF) investigations. The GoF comprises a set of statistical values describing how the level in which a model fits in a set of observations. Measures of GoF typically summarise the discrepancies between observed values and those which are expected under the model in question (Hu &

Bentler, 1999). When GoF is successfully passed, it indicates the acceptable quality of the adjustment of observations problems represented by the model.

Other than Cronbach's Alpha, CRI and AVE, as discussed previously, SmartPLS leverages the following techniques to ascertain the model fit; Coefficient of determination (R^2), standardised root mean square residual (SRMR), reliability coefficient (rho_A), heterotrait-monotrait ratio of correlations (HTMT) and collinearity statistics (Variance inflation factor (VIF)). The following parts of this section will briefly discuss these terms.

It is recommended to examine the variance explained by the structural model in terms of the coefficient of determination (R^2), also known as the Squared Multiple Correlations. This value reveals the proportion of the total variance in the dependent latent variables represented by the independent latent variables (Chin, 1998; Tenenhaus et al., 2005). The R^2, similar to a multiple regression model, predicts how the independent latent variable(s) (in this case, the winning and not winning syndicates) are correlated with the dependent latent variables (in this case, the cognitive-behavioural clusters). R^2 values suggest the explanatory power. They range between 1 and 0 and the higher the score, the better explanatory power (Vandenbosch 1996). According to Cohen (1992), an R^2 value of 0.12 or below suggests a low explanatory power and values between 0.13 to 0.25 signify a medium prediction. A score higher than 0.26 represents a substantial prediction. Other researchers such as Wetzels, Odekerken-Schröder and Van Oppen (2009) interpret small, medium and large model fit by taking the cut-offs ranges in the order of 0.10, 0.25, or 0.36. However, owing to the complex nature of social sciences research, Falk and Miller,

(1992) recommend that an R^2 value equal to or greater than 0.10 of a particular endogenous construct can be deemed adequate. Indeed, this proposition is supported by Moksony (1990) who suggested that when it comes to social science research, “small is beautiful”. This research adopts the values proposed by Falk and Miller (1992).

Standardized Root Mean Square Residual (SRMR) is an absolute measure of fit and is defined as the standardized difference between the observed correlation and the predicted correlation. According to Hu and Bentler (Hu & Bentler, 1999), a value less than 0.08 is commonly regarded as a model with a good fit quality. Other scholars have suggested that an SRMR of between 0.08 to 0.10 still provides an acceptable fit (MacCallum, Browne & Sugawara, 1996). This research therefore adopts the value proposes by (MacCallum et al., 1996).

Collinearity is a condition in which some of the independent variables are highly correlated. The variance inflation factor (VIF) for outer model is the measure detecting multicollinearity in regression analysis. Multicollinearity is when there is a strong correlation among independent variables in a model and such issues can adversely affect the regression results. The VIF value exceeding 4.0, or by less than 0.2, indicates a problem with multicollinearity (Hair et al., 2009).

The heterotrait-monotrait ratio of correlations (HTMT) is a technique which can aid the researchers to evaluate the discriminant validity in PLS-SEM. Discriminant validity is another crucial index of model evaluation. Unless the discriminant validity is achieved, the investigation cannot assure the results obtained can advise whether or not the hypothesised structural paths are of good quality, or whether they are merely the aftermath of statistical discrepancies. The HTMT criterion has been suggested to be a better technique than the classical discriminant validity assessment, such as Fornell-Larcker criterion and cross-loadings, which are largely unable to detect a lack of discriminant validity. According to Garson (2016), a well-fitting model should show a below 1.0 HTMT ratio. However, some scholars advocate the acceptable value should be between 0 and 0.85 (Clark & Watson 1995; Kline 2011), whereas others posit the range to be between 0 to 0.90 (Gold et al. 2001; Teo, Srivastava & Jiang, 2008).

Comparative Fit Index (CFI) has also been suggested as a measure. However, in multilevel repeated variance modelling, the measurement occasions are nested within latent variables, and it is necessary to introduce repeated data measures. In such cases, the CFI calculation may not be necessary (Hair, Jr. 2016)

After the quality of the model-fit is considered to be acceptable, PLS-SEM shall analyse the path coefficients and test for causal relations among latent variables. The findings can assist the researcher to validate the hypothesised causal relationships between the cognitive-behaviours and the *CI* of the ALP teams.

3.3.9.8 Regression and predictability

PLS-SEM provide the researcher with an understanding of the predictive power of the observable item to the latent variables, also known as the size. Effect size is a statistical concept that measures the magnitude or strength of an effect or a phenomenon, such as the relationship between two variables on a numeric scale. Cohen's f squared (f^2) method is generally used to measure the size of the effect of extra endogenous variables, whilst calculating its effect on the model. Thus, f^2 values inform the researcher of the degree of importance of a particular variable or construct to the proposed model (Hair et al., 2014). According to Chin (1998), the f^2 values of 0.02, 0.15, and 0.35 for the significant variables represent weak, moderate and substantial effects, respectively. However, a small value of f^2 is not an implication of a negligible effect.

The Stone-Geisser test of Q^2 values is often leveraged to examine the predictive applicability and stability of the model of the latent constructs (Chin, 2010). The Q^2 values permit the researchers to determine how well the model's parameters can reconstruct the observed values (Bagozzi 1997). Stone-Geisser's Q^2 value is a sample re-use technique, and it cross-validates the predictiveness of the PLS path model (Stone, 1974; Geisser, 1974). Any Q^2 value, that is found to be higher than 0 indicates that the particular latent variable has predictive power.

The t-statistics is used to accept or reject a hypothesis, and it reveals the ratio of the departure of the estimated value of a parameter from its hypothesised value to its standard error. Using the bootstrap analyses, the statistical significance of the path coefficients and the t-statistics can lead to more conservative but higher significance figures (Fornell & Barclay 1983; Chin 1998). The technique does assume that the sample distribution is an adequate representation of the population distribution. Overall, a path coefficient must be rejected if the t-statistics value falls below 1.96, with p-value of <0.05 (Hair et al., 2006). These values are adopted by this research.

Lastly, in order to understand the correlation between the independent and dependent variables, path coefficients (β) must be calculated. Path coefficients are standardised correlations measurements, and they indicate the direction relationship of how a variable is causing an effect on another variable. The magnitude of a path coefficient indicates the extent of the effect of the independent variable on the dependent variable (Hair et al., 2006; Tenenhaus et al. 2005).

3.4 Ethical considerations

Research ethics are standards that guide a researcher's ethical choices about how to conduct the study without making the respondents suffer from adverse consequences after partaking the research activity (Saunders et al., 2012). Ethical considerations assist researchers to determine the difference between acceptable and unacceptable research design. This study observes the University of the Witwatersrand's (Wits) ethics policy. Since this research involved human participants, an ethics application was submitted to Wits ethics committee in 2016, and the application received the approval from the Human Research Ethics Committee (Non-Medical) in the same year. The reference number for the ethics clearance is H16/08/06. A copy of the ethics clearance certificate is included in Annexure B.

To ensure that all ALP team members understood that they are not obligated to participate in this study, the researcher clearly emphasised that the participation of this questionnaire is on a voluntary basis prior to launching the surveying process. The right of refusal by the delegates to participate in this study was respected during the surveying process and in fact, some delegates did exercise their right by not participating in the study despite being present in the room.

The steps taken to increase the response rate followed the recommendations stated in section 3.3.5, which were within the boundary of ethics according to the recommendations offered by Boynton (2004). Unethical approaches such as violating the confidentiality, anonymity and the non-disclosure agreements were strictly avoided. All syndicate members were clearly informed that in partaking in the surveying process, they had automatically given the consent to the research. Additionally, the surveying instrument did not request participants to provide their personal detail, and data sets were coded to entrench confidentiality during the data capturing process (Saunders et al., 2012).

This research received consent from the L&D managers of different programmes and programme manager of the business school before administering the survey to the delegates. The original emails were included in the application of the ethical clearance with the Human Research Ethics Committee (Non-Medical) of Wits.

3.5 Methodological limitations

Measuring the cognitive-behavioural characteristics of the team members in natural settings can be a tricky process. One of the methodological limitations of the study would be owing to the fact that the assessment relies on the subjective perspectives of all participants on the last day of the ALP journey. Considering that an ALP process typically stretches over numerous months and this study did not conduct a longitudinal investigation to assess the consistency of the behaviours across the whole ALP journey, the responses from the participants may not fully reveal how each team has been working throughout the months. The memory biases of the delegates could influence the quality of the data. Regrettably, as it is implausible to assign an independent observer to evaluate member' behaviours for all ALP teams across the journey independently and periodically; this study can only hold the perspectives of all the participants as the reality.

Throughout the CEE programme, delegates have participated in various surveys, and one could argue they are used to completing surveys. However, this study could not offer the full assurance that all responses provided by the participants were not affected by the mood of the participants. Despite that the day could be nerve-wracking for some delegates before the ALP teams had delivered their presentations, commonly the emotion states for all delegates are a lot more positive afterwards. Majority of the delegates commonly felt relieved, and some of them even felt more positive after having interacted with the judges. Moreover, owing to the ethos of the businesses school that implemented the CEE programme, the comments from the judges were inclined to be fair and nurturing when they interacted with ALP teams so technically speaking the delegates could be more at ease by the time they participate in the surveying process. However, the emotional states of the participants are definitely a methodological limitation of this study as not all participants react to stress equally. Having stated so, the research approach adopted by this study is similar to other team science or psychology studies which required participants to take part in intense competition or to be subjected to stressful conditions. Such as in one of CI experiments, participants were subjected to time-pressured highly intense competitive online video games (Kim et al., 2017). Therefore, while this study cannot guarantee how the mental state of the participants would play absolutely no role in the way they responded to the surveys, the condition of the study did not deviate substantially from other psychological studies.

It is worth noting that the programme delivery style of the business school which implemented these management development programmes tends to be uplifting and positive. This may have affected the ST and TMX cognitive-behaviours of the delegates. The contents of the programme and the coaches assigned to assist the ALP teams encourage the delegates to think differently and apply their lessons practically. In addition, all participants selected to attend the CEE programmes were recognised either as high potential employees or talented leaders so they could be more inclined to think more effectively. This study cannot confidently eradicate the effect as the result of delegates being more familiar with some of the ALP challenges than other delegates.

Lastly, the responses from the participants may be influenced by the culture in South Africa. Participants from different parts of the world may rate their cognitive-behaviours quite differently when they were also tasked to rate the collective cognitive-behaviours of their teams.

3.6 Chapter conclusion

This chapter first articulated the ontology, epistemology and axiology adopted by this research. The rationales for adopting them were also reflected. The subsequent sections presented the research design by defining the methodology and then unpacking the questions around how this study would go about obtaining the understandings on the phenomenon of interest. The research approach, questionnaire design and data collection processes were deliberated. Additionally, various data analysis techniques considered by this study were also presented succinctly. Finally, before concluding the chapter, the ethical consideration and methodological limitations of this study were emphasised.

CHAPTER 4: ANALYSIS AND FINDINGS

4.1 Introduction

The focus of this chapter is to present the outcome of the analyses from the data obtained through the research questionnaire constructed in the previous chapter. This chapter shall commence with a series of descriptive statistics. An assessment of theoretical reliability of the items of each factor will be carried out and deliberated. The chapter will then conduct the exploratory and confirmatory factor analyses (EFA/CFA) that aim to reduce the dimensionality of the datasets obtained from "Rate Self" and "Rate Team" surveying approaches. It is the prerequisite step before one can formulate the preliminary theoretical models. Based on the outcome of these analyses, these models will be subjected to various structural equation modelling (SEM) procedures. The findings of the SEM calculations will be presented before the chapter offers a concise chapter conclusion.

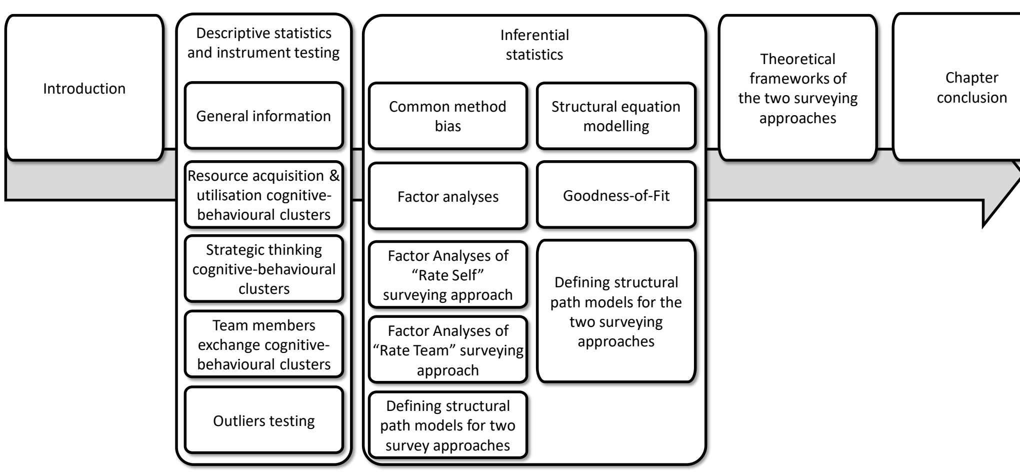

Figure 4.1 The flow and major components of Chapter 4 (author's own)

4.2 Descriptive statistics and instrument testing

Checking the data accuracy by verifying the range of responses, values, means, and standard deviations is an essential step for quantitative research (Tabachnick & Fidell, 2001). The primary aim of the descriptive analysis is to investigate the characteristics of the datasets obtained from both "Rate Self" and "Rate Team" surveying approaches. Overall, no missing value was detected from the datasets.

4.2.1 General information

A total of 745 delegates from 20 customised executive education programmes were targeted over an almost 3-year period. As some delegates had exercised their right to decline to participate in the study or did not fully complete the survey, this study only made use of the input from 406 delegates of 12 programmes. This figure translates to 54.50% of the total delegates invited to take part in the study. It is an acceptable figure for research studies conducted at the organisational level (Baruch & Holtom 2008).

Among the 406 delegates who participated in the survey process, 69 of them come from the "Win Only" teams. These are the syndicates which won the ALP competition for their programmes. The remaining 302 delegates who were not first prize winners were clustered into the pool of "Not Win" teams. The information of industries which the companies implementing these programmes belong to has been documented in Table 5.1. In total, the delegates cover five industries, and the findings suggest that the samples represent a diverse industry.

Table 4.1 Description of the industries covered in this research

Sector	No. of Programmes	"Win Only"	"Not Win"
Financial	6	7.95%	40.95%
Manufacturing	2	3.58%	14.50%
Transport	1	2.19%	10.93%
Retail	2	2.19%	9.15%
Telecommunication	1	0.99%	5.57%
Total	12	16.90%	81.10%

The means (μ), standard deviations (σ), kurtosis and skewness for each item obtained from both surveying approaches are documented in Tables 4.2 to 4.4 (from Section 4.2.2 to 4.2.3). The differences of means, σ, kurtosis and skewness values, denoted as Δ_{μ}, Δ_{σ}, $\Delta_{Kurtosis}$ and $\Delta_{Skewness}$, are also calculated by using the values obtained from "Rate Self" surveying approach to subtract those of the "Rate Team" surveying approach. The average value for each of the above-stated calculations were also included in Tables 4.2 to 4.4.

Overall, the standard errors for skewness and kurtosis of the datasets obtained from both surveying approaches are within the acceptance thresholds for skewness and kurtosis (Kim, 2013).

4.2.2 Resource acquisition and utilisation cognitive-behavioural clusters

The average values for all items are found to be above average. The skewness values indicate that all items measured are negatively skewed. But the effect is moderate. These figures suggested that in general, delegates believe that the quality of their RAU cognitive-behaviours are above average. They also deemed the collective RAU cognitive-behaviours of above average too.

When comparing the means of the datasets of RAU clusters obtained from two different surveying approaches as documented in Table 4.2, the average means of the "Rate Self" surveying approach (6.158) was found to be 0.615 higher than the ones from the "Rate Team" approach (5.544). The average $\Delta_{Skewness}$ between the surveying approaches is -0.279 and this finding reveals that the "Rate Self" surveying approach produces more negative curves. These values indicate that more survey participants scored their resource RAU cognitive-behaviours higher than how they scored their own teams.

Table 4.2 Descriptive statistics of the RAU cluster from both surveying approaches

"Rate Self"					"Rate team"					Differences			
Item	**μ**	**σ**	**Kurtosis**	**Skewness**	**Item**	**μ**	**σ**	**Kurtosis**	**Skewness**	Δ_{μ}	Δ_{σ}	$\Delta_{Kurtosis}$	$\Delta_{Skewness}$
I1a-RS	6.214	0.888	-0.188	-1.047	**I1a-RT**	5.697	1.078	-0.007	-0.701	0.517	-0.190	-0.181	-0.346
I1b-RS	6.241	0.845	-0.175	-1.014	**I1b-RT**	5.707	1.090	-0.005	-0.728	0.534	-0.245	-0.170	-0.286
I2a-RS	6.207	0.866	-0.212	-0.915	**I2a-RT**	5.667	1.067	-0.002	-0.682	0.540	-0.201	-0.210	-0.233
I2b-Rs	6.197	0.937	-0.165	-0.980	**I2b-RT**	5.685	1.120	-0.006	-0.748	0.512	-0.183	-0.159	-0.232
I3a-RS	6.177	0.951	-0.295	-0.861	**I3a-RT**	5.808	0.989	-0.024	-0.696	0.369	-0.038	-0.271	-0.165
I3b-RS	6.180	0.939	-0.340	-0.907	**I3b-RT**	5.773	1.038	-0.032	-0.710	0.407	-0.099	-0.308	-0.197
I4a-RS	6.116	0.915	-0.313	-0.858	**I4a-RT**	5.761	1.010	-0.030	-0.653	0.355	-0.095	-0.283	-0.205
I4b-RS	6.123	0.970	-0.362	-0.867	**I4b-RT**	5.798	1.043	-0.043	-0.753	0.325	-0.073	-0.319	-0.114
I5a-RS	6.099	0.952	-0.208	-0.748	**I5a-RT**	5.200	1.106	-0.177	-0.401	0.899	-0.154	-0.031	-0.347
I5b-RS	6.148	0.956	-0.227	-0.806	**I5b-RT**	5.180	1.138	-0.163	-0.377	0.968	-0.182	-0.064	-0.429
I6A-RS	6.111	0.988	-0.247	-0.840	**I6a-RT**	5.079	1.131	-0.191	-0.422	1.032	-0.143	-0.056	-0.418
I6b-RS	6.086	0.960	-0.271	-0.777	**I6b-RT**	5.167	1.190	-0.226	-0.406	0.919	-0.230	-0.045	-0.371
Average	6.158	0.931	-0.250	-0.885	**Average**	5.544	1.083	-0.076	-0.606	0.615	-0.153	-0.175	-0.279

On the contrary, the overall average of the standard deviations of the "Rate Self" surveying approach is lower than that of the "Rate Team" surveying approach (-0.153). This subtle clue is somewhat intriguing. It could mean that these 406 survey participants regard their own cognitive-behaviours more similarly than when they reflect upon the collective cognitive-behaviours of their respective teams. Lastly, the kurtosis values and the $\Delta_{Kurtosis}$ did not bring about enough meaningful insight. Even though the kurtosis values are all negative, they were relatively small in general.

4.2.3 Strategic thinking cognitive-behavioural clusters

The average $\Delta\mu$ value tabulated in Table 4.3 reveals that that participants score their own strategic thinking cognitive-behaviours 0.831 higher than when they rate the same cognitive-behaviours exhibited by their respective teams as collectives (average mean scores are 6.178 and 5.348, respectively). Once again, the σ of team is greater than σ of individuals. The Δ_σ suggested that individuals tend to hold more contrasting views about the cognitive-behaviours of their teams than about themselves. These values are higher than the similar values of the RAU cognitive-behavioural clusters.

Similarly, apart from the obvious observation that all items measured are negatively skewed, the average $\Delta_{Skewness}$ is -0.331, which suggest that the scores from the “Rate Self” surveying approach are weighted more towards the higher side of the Likert scale than the scores obtained from the “Rate Team” surveying approach. This observation concurs with the above-stated findings that individuals score the magnitude of their strategic thinking higher than they score their respective teams.

The average Δ_σ of the ST cognitive-behavioural datasets is -0.349. This difference suggests that participants once again viewed the magnitude of the ST cognitive-behaviours of their own a little bit less diverse than how they viewed the ST cognitive-behaviours of their respective teams. The extent of all the average $\Delta_{Kurtosis}$ values was found to be relatively small once again and therefore it does not provide a significant clue towards the nature of the "tailedness distribution" of the curves. The skewness once again indicated the datasets are moderately skewed.

Table 4.3 Descriptive statistics of the ST cluster from both surveying approaches

"Rate Self"					"Rate team"					Differences			
Item	**μ**	**σ**	**Kurtosis**	**Skewness**	**Item**	**μ**	**σ**	**Kurtosis**	**Skewness**	Δ_{μ}	Δ_{σ}	$\Delta_{Kurtosis}$	$\Delta_{Skewness}$
I7a-RS	6.126	0.988	-0.407	-0.853	**I7a- RT**	4.941	1.315	-0.194	-0.343	1.185	-0.327	-0.213	-0.510
I7b-RS	6.158	0.936	-0.306	-0.843	**I7b- RT**	4.904	1.398	-0.187	-0.398	1.254	-0.462	-0.119	-0.445
I8a-RS	6.086	0.934	-0.291	-0.857	**I8a- RT**	5.486	1.156	-0.171	-0.643	0.600	-0.222	-0.120	-0.214
I8b-RS	6.133	1.003	-0.293	-0.871	**I8b- RT**	5.426	1.253	-0.168	-0.673	0.707	-0.250	-0.125	-0.198
I9a-RS	6.121	0.951	-0.249	-0.864	**I9a- RT**	5.512	1.172	-0.160	-0.564	0.609	-0.221	-0.089	-0.300
I9b-RS	6.116	0.972	-0.248	-0.831	**I9b- RT**	5.480	1.167	-0.168	-0.661	0.636	-0.195	-0.080	-0.170
I10a-RS	6.175	0.937	-0.104	-0.896	**I10a- RT**	5.300	1.421	-0.426	-0.434	0.875	-0.484	0.322	-0.462
I10b-RS	6.133	0.968	-0.156	-0.824	**I10b- RT**	5.145	1.358	-0.431	-0.467	0.988	-0.390	0.275	-0.357
I11a-RS	6.175	0.929	-0.130	-0.909	**I11a- RT**	5.286	1.196	-0.452	-0.458	0.889	-0.267	0.322	-0.451
I11b-RS	6.192	0.927	-0.179	-0.912	**I11b- RT**	5.276	1.278	-0.377	-0.520	0.916	-0.351	0.198	-0.392
I12a-RS	5.961	0.949	-0.263	-0.477	**I12a- RT**	5.103	1.344	-0.479	-0.467	0.858	-0.395	0.216	-0.010
I12b-RS	5.968	0.935	-0.258	-0.481	**I12b- RT**	5.175	1.430	-0.397	-0.519	0.793	-0.495	0.139	0.038
I13a-RS	6.421	0.734	-0.156	-1.111	**I13a- RT**	5.803	1.081	-0.103	-0.718	0.618	-0.347	-0.053	-0.393
I13b-RS	6.397	0.767	-0.159	-1.175	**I13b- RT**	5.594	1.142	-0.110	-0.550	0.803	-0.375	-0.049	-0.625
I14a-RS	6.360	0.796	-0.175	-1.119	**I14a- RT**	5.554	1.177	-0.127	-0.699	0.806	-0.381	-0.048	-0.420
I14b-RS	6.330	0.839	-0.166	-1.112	**I14b- RT**	5.478	1.263	-0.172	-0.727	0.852	-0.424	0.006	-0.385
Average	6.178	0.910	-0.221	-0.883	**Average**	5.348	1.259	-0.258	-0.553	0.831	-0.349	0.036	-0.331

4.2.4 Team-member exchange cognitive-behavioural clusters

Table 4.4 reveals that the overall average Δ_{μ} value of the TMX cognitive-behavioural cluster is 0.994, the highest compared to the similar value of the RAU and ST clusters. As the overall average Δ_{σ} value reveals that the scores obtained from the "Rate Self" surveying approach deviate much less than the scores obtained from the "Rate Self" surveying approach (-0.455), once again this observation implies that contrasting views exist when participants evaluate their own cognitive-behaviours in comparison to how they see their teams' cognitive-behaviours.

The skewness values for both surveying approaches indicate that all items measured lead to different degrees of negatively skewed curvature, but nevertheless, weighted heavier on the higher side of the Likert scale. The average $\Delta_{Skewness}$ value of -0.613 reveals that the scores obtained from the “Rate Self” surveying approach are more asymmetric than the scores obtained from the “Rate Team” surveying approach, with larger proportions above the mid-point of the 7 Likert scale. But the score is between -1 and 1, so the distribution is only moderately skewed.

Table 4.4 Descriptive statistics of the TMX cluster from both surveying approaches

“Rate Self”					“Rate team”					Differences			
Item	**μ**	**σ**	**Kurtosis**	**Skewness**	**Item**	**M**	**σ**	**Kurtosis**	**Skewness**	**Δ_{μ}**	**Δ_{σ}**	**$\Delta_{Kurtosis}$**	**$\Delta_{Skewness}$**
I15a-RS	6.325	0.832	-0.081	-1.005	**I15a-RT**	5.448	1.338	-0.283	-0.797	0.877	-0.506	-0.083	-0.797
I15b-RS	6.288	0.864	-0.054	-0.961	**I15b-RT**	5.404	1.322	-0.248	-0.812	0.884	-0.458	-0.248	-0.812
I16a-RS	6.212	0.907	-0.454	-0.809	**I16a-RT**	5.323	1.362	-0.036	-0.646	0.889	-0.455	-0.136	-0.646
I16b-RS	6.232	0.866	-0.498	-0.764	**I16b-RT**	5.308	1.317	-0.083	-0.575	0.924	-0.451	-0.083	-0.575
I17a-RS	6.086	0.939	-0.528	-0.639	**I17a-RT**	5.296	1.281	-0.055	-0.545	0.790	-0.342	-0.005	-0.545
I17b-RS	6.170	0.914	-0.472	-0.790	**I17b-RT**	5.291	1.298	-0.035	-0.600	0.879	-0.384	-0.035	-0.600
I18a-RS	6.246	0.887	-0.123	-0.992	**I18a-RT**	5.148	1.382	-0.196	-0.484	1.098	-0.495	-0.196	-0.784
I18b-RS	6.256	0.853	-0.103	-0.971	**I18b-RT**	5.167	1.340	-0.183	-0.465	1.089	-0.487	-0.183	-0.765
I19a-RS	6.259	0.871	-0.095	-0.932	**I19a-RT**	5.135	1.326	-0.217	-0.518	1.124	-0.455	-0.217	-0.518
I19b-RS	6.236	0.917	-0.114	-0.948	**I19b-RT**	5.091	1.348	-0.229	-0.469	1.145	-0.431	-0.259	-0.469
I20a-RS	6.212	0.896	-0.405	-0.780	**I20a-RT**	5.094	1.400	-0.211	-0.460	1.121	-0.504	-0.421	-0.460
I20b-RS	6.153	0.924	-0.417	-0.835	**I20b-RT**	5.047	1.413	-0.231	-0.483	1.106	-0.489	-0.583	-0.383
Average	6.223	0.889	-0.279	-0.869	**Average**	5.229	1.344	-0.167	-0.571	0.994	-0.455	-0.204	-0.613

All kurtosis values and $\Delta_{Kurtosis}$ once again do not provide any meaningful clues that can lead the researcher to posit which cluster of the cognitive-behaviours may affect the *CI* more than others. But the slight negative kurtosis is not significant enough to cause any challenges for the subsequent statistical calculations.

The summary of the descriptive statistics of the three cognitive-behavioural clusters, key observations and interpretations can be found in Section 5.3.

4.2.5 Outliers testing

Due to the nonparametric nature of the data, all upper-bound values for this analysis are 7 – the highest score of the Likert scale. Therefore, outliers for a particular hypothesis in the context of this research reflect the magnitude in which the delegates consider themselves or their teams' exhibiting of a particular cognitive-behaviour much less effective than how other team members rate their own performance or the general performance of the teams as collectives. The outlier data points could infer the perspective disparities among the ALP teams which subsequently affect the outcome of *CI* during the ALP competitions.

After the statistical analysis, the outliers were determined. For “Rate Self” surveying approach, 263 out of the 16240 data points can be considered as outliers. Whereas 387 out of the 16240 data points can be considered as outliers for “Rate Team” surveying approach. These figures translate to 1,62% and 2,38% of outlier percentage for “Rate Self” and “Rate Team” surveying approaches, respectively. After much deliberation, this research decided to incorporate all the outlier scores as part of the data. The cognitive-behaviours of these outliers may have influenced the *CI* of the syndicate team in a meaningful way. Therefore, omitting these scores seems illogical.

4.3 Instrument testing: Reliability and consistency among items

Upon setting out to design a rigorous research project, there are numerous applicable rules to consider, however the most general rule requires establishing internal reliability before addressing the validity of measurement items, as consistency is seen as a necessary but insufficient condition required to establish construct validity (Saunders et al., 2012). One of the main functions of the reliability checks of all collected data is to assert that the data would not be subject to significant variation (Babbie, 2010) seeing that the questions asked for both items per hypothesis were unidentical but based on the same general idea. Furthermore, it is likely that the total length of the survey is close to the maximum that participants would be willing to partake in, especially given the seniority of the participants surveyed. Therefore, it was necessary to perform the reliability and consistency tests.

Reliability and consistency measures were deployed to 1) assess the intra-construct items per hypothesis per survey approach, 2) compare similar items across surveying approaches and 3) evaluate between the “Win Only” and “Not Win” groups. The first objective of conducting these exercises is to examine whether the items within a hypothesis per survey approach remain reliable and consistent with each other. The second objective is to gain clues on whether both surveying approaches lead to datasets with similar underlying structures. Last assessment aims to ascertain if the two categories of ALP teams are indeed different.

4.3.1 Intra-construct items

Table 4.5 captures the range of reliability value when validating the consistency between the two items under the same hypothesis surveyed by the same approach. For example, for each surveying approach, I1a-RS was evaluated against I1b-RS, and I1a- RT against I1b- RT, and so forth.

Table 4.5 Summary of Cronbach's Alpha values of items within a hypothesis per surveying approach

Cluster	"Rate Self"		"Rate Team"	
	Items	Cronbach's α	Items	Cronbach's α
RAU	I1a-RS & I1b-RS	0.801	I1a-RT & I1b-RT	0.731
	I2a-RS & I2b-RS	0.813	I2a-RT & I2b-RT	0.793
	I3a-RS & I3b-RS	0.878	I3a-RT & I3b-RT	0.800
	I4a-RS & I4b-RS	0.861	I4a-RT & I4b-RT	0.782
	I5a-RS & I5b-RS	0.810	I5a-RT & I5b-RT	0.847
	I6a-RS & I6b-RS	0.824	I6a-RT & I6b-RT	0.800
ST	I7a-RS & I7b-RS	0.853	I7a-RT & I7b-RT	0.878
	I8a-RS & I8b-RS	0.826	I8a-RT & I8b-RT	0.821
	I9a-RS & I9b-RS	0.841	I9a-RT & I9b-RT	0.818
	I10a-RS & I10b-RS	0.834	I10a-RT & I10b-RT	0.851
	I11a-RS & I11b-RS	0.831	I11a-RT & I11b-RT	0.823
	I12a-RS & I12b-RS	0.827	I12a-RT & I12b-RT	0.819
	I13a-RS & I13b-RS	0.830	I13a-RT & I13b-RT	0.828
	I13a-RS & I14b-RS	0.811	I13a-RT & I14b-RT	0.772
TMX	I15a-RS & I15b-RS	0.891	I15a-RT & I15b-RT	0.865
	I16a-RS & I16b-RS	0.887	I16a-RT & I16b-RT	0.859
	I17a-RS & I17b-RS	0.865	I17a-RT & I17b-RT	0.795
	I18a-RS & I18b-RS	0.849	I18a-RT & I18b-RT	0.807
	I19a-RS & I19b-RS	0.861	I19a-RT & I19b-RT	0.766
	I20a-RS & I20b-RS	0.852	I20a-RT & I20b-RT	0.799

In general, the Cronbach's Alpha values indicate that there is a high consistency between the two items of one construct under both rating approaches, "Rate Self" and "Rate Team". Overall, the internal consistency ranged from excellent ($\alpha > 0.8$) to acceptable ($\alpha > 0.6$). The mean of the "Rate Self" consistency is 0.842 with a standard deviation (σ) of 0.026. Similarly, the mean for the

Cronbach's Alpha values of "Rate Team" is 0.813 with a standard deviation (σ) of 0.036. These findings suggest that internal consistency between "item a" and "item b" within each hypothesis is adequate and all items can be subjected to further statistical analyses.

4.3.2 Different surveying approaches

When conducting a cross comparison of the same item across the two different surveying approaches, (i.e. evaluating the Cronbach's Alpha for H1a-RS ("Rate Self") and H1a- RT ("Rate Team"; H1b-RS ("Rate Self") and H1b- RT ("Rate Team"); and so forth), the consistency dropped significantly. The findings are captured in Table 4.6.

Table 4.6 Summary of Cronbach's Alpha values of items from different surveying approaches

Cluster	(a) "Rate Self" & (a) "Rate Team"		(b) "Rate Self" & (b) "Rate Team"	
	Items	Cronbach's α	Items	Cronbach's α
RAU	I1a-RS & I1a-RT	0.446	I1a-RS & I1b-RT	0.406
	I2a-RS & I2a-RT	0.485	I2a-RS & I2b-RT	0.464
	I3a-RS & I3a-RT	0.310	I3a-RS & I3b-RT	0.324
	I4a-RS & I4a-RT	0.447	I4a-RS & I4b-RT	0.460
	I5a-RS & I5a-RT	0.504	I5a-RS & I5b-RT	0.489
	I6a-RS & I6a-RT	0.503	I6a-RS & I6b-RT	0.517
ST	I7a-RS & I7a-RT	0.432	I7a-RS & I7b-RT	0.400
	I8a-RS & I8a-RT	0.326	I8a-RS & I8b-RT	0.321
	I9a-RS & I9a-RT	0.341	I9a-RS & I9b-RT	0.318
	I10a-RS & I10a-RT	0.222	I10a-RS & I10b-RT	0.260
	I11a-RS & I11a-RT	0.287	I11a-RS & I11b-RT	0.223
	I12a-RS & I12a-RT	0.227	I12a-RS & I12b-RT	0.219
	I13a-RS & I13a-RT	0.260	I13a-RS & I13b-RT	0.282
	I13a-RS & I14a-RT	0.257	I13a-RS & I14b-RT	0.277
TMX	I15a-RS & I15a-RT	0.329	I15a-RS & I15b-RT	0.353
	I16a-RS & I16a-RT	0.470	I16a-RS & I16b-RT	0.469
	I17a-RS & I17a-RT	0.435	I17a-RS & I17b-RT	0.428
	I18a-RS & I18a-RT	0.519	I18a-RS & I18b-RT	0.497
	I19a-RS & I19a-RT	0.511	I19a-RS & I19b-RT	0.506
	I20a-RS & I20a-RT	0.515	I20a-RS & I20b-RT	0.512

The majority of Cronbach's Alpha values are unacceptable, with only a selected few higher than 0.5. This observation suggests that the consistency between items from different surveying approaches are low. This observation correlates with one of the previous observations made from the descriptive statistics procedures which suggested that two types of surveying approaches indeed lead to different outcomes. The level of dissimilarity of the datasets obtained from the two surveying approaches is further assessed using the known group validity independent sample t-test (Section 4.4.2).

In short, the above-stated findings suggest that the underlying data structures of "Rate Self" and "Rate Team" surveying approaches are different. Therefore, each surveying approach deserves its own factor analyses and SEM calculation. Based on this important observation, the inferential statistics will treat the datasets from "Rate Self" and "Rate Team" surveying approaches individually. EFA and CFA will be first performed on "Rate Self" datasets in an attempt to extract the correct factors. Based on these factors, the conceptual structural path model diagram for the "Rate Self" surveying approach will be presented. Subsequently, the statistical procedures will be repeated on the dataset of "Rate Team" surveying approach to generate another structural path model diagram to describe the "Rate Team" surveying approach. Afterwards the reliability and validity of the new factors will be inspected. Once these factors are deemed reliable and valid, SEM calculations will be performed separately on these two sets of data using their respective structural path model diagrams. The model fit evaluations will be conducted. Finally, the correlation and regression measures of the latent variables of the three cognitive-behavioural clusters (RAU, ST and TMX) against the *CI* for each surveying approach will be studied as an attempt to validate the original hypotheses.

4.4 Inferential statistics

Statistical inference is the process of using data analysis to surmise properties of an underlying probability distribution. Inferential statistical analysis also infers properties of a population. In this section, common method biases and reliability of items were carried out first to guide the EFA/CFA process. After obtaining the model from factor analyses, a series of SEM calculations were carried out to probe the correlation between the factors within each cognitive-behavioural cluster against the outcome of the APL competitions.

4.4.1 Common method bias

When self-administered questionnaires are used, common variance bias problems are likely to emerge or increase (Podsakoff and MacKenzie, 2003). The common method variance (CMV) analysis were carried out. A Harman's single factor test and a common latent factor (CLF) analysis were performed to capture the calculation, which must explain more than 23% of the variance.

After performing the said calculations, the findings suggest for the “Rate Self” surveying approach, the respective common latent factor for three clusters of hypotheses are all above 23% (RAU = 34.28, ST = 37.95 and TMX = 29.12). Similarly, the common factor values for all data obtained from the “Rate Team” surveying approach are also higher than 23% (RAU = 29.87, ST = 31.88, TMX = 37.24).

4.4.2 Known group validity: independent samples t-test

The independent sample t-test was performed to compare the differences between the datasets obtained from “Rate Self” and “Rate Team” surveying approach. For two tails comparison, the acceptable threshold is 1.984 for sample size above 400. The findings for equal variances assumed are presented in Table 4.7. The results show that while the Cronbach's α suggests that the datasets obtained from the same question items of the two different approaches (Section 4.3.2) are different, the said differences for 1-H1a, I-H1b, 1-H2a, I-H2b, 1-H3a, I-H3b, 1-H4a and I-H4b, were not deemed significant by the t-test. Not only that their t-test did not produce values that exceed the threshold, range between the upper and lower intervals for the 95% Confidence do not cross zero. In other words, apart from hypotheses 1, 2, 3 and 4, the "Rate Self" and "Rate Team" surveying approaches produced datasets that are significantly different from each other.

Table 4.7 Known group t-test scores

Items	t-test for equality of mean	95% Confidence Interval of the Difference		Significantly different	Items	t-test for equality of mean	95% Confidence Interval of the Difference		Significantly different	Items	t-test for equality of mean	95% Confidence Interval of the Difference		Significantly different
		Lower	Upper				Lower	Upper				Lower	Upper	
RAU cognitive-behavioral cluster					**ST cognitive-behavioral cluster**					**TMX cognitive-behavioral cluster**				
I-H1a	1.807	-0.539	0.744	No	I-H7a	4.739	0.431	0.741	Yes	I-H15a	3.206	0.735	1.063	Yes
I-H1b	1.865	-0.423	0.853	No	I-H7b	5.061	0.534	0.836	Yes	I-H15b	3.255	0.716	1.043	Yes
I-H2a	1.898	-0.404	0.748	No	I-H8a	2.172	0.659	1.021	Yes	I-H16a	3.317	0.800	1.141	Yes
I-H2b	1.791	-0.455	0.753	No	I-H8b	2.582	0.788	1.138	Yes	I-H16b	3.462	0.802	1.119	Yes
I-H3a	1.263	-0.493	0.784	No	I-H9a	2.194	0.613	0.939	Yes	I-H17a	2.960	0.583	0.920	Yes
I-H3b	1.402	-0.484	0.778	No	I-H9b	2.303	0.583	0.924	Yes	I-H17b	3.299	0.752	1.090	Yes
I-H4a	1.226	-0.366	0.732	No	I-H10a	3.276	0.884	1.234	Yes	I-H18a	4.235	0.888	1.230	Yes
I-H4b	1.114	-0.042	0.732	No	I-H10b	3.803	0.834	1.195	Yes	I-H18b	4.190	1.010	1.350	Yes
I-H5a	3.427	0.779	1.103	Yes	I-H11a	3.338	0.366	0.663	Yes	I-H19a	4.348	0.849	1.171	Yes
I-H5b	3.703	0.910	1.243	Yes	I-H11b	3.445	0.508	0.807	Yes	I-H19b	4.460	0.901	1.232	Yes
I-H6a	4.019	0.392	0.697	Yes	I-H12a	3.331	0.107	0.405	Yes	I-H20a	4.367	0.847	1.183	Yes
I-H6b	3.523	0.454	0.768	Yes	I-H12b	3.038	0.407	0.730	Yes	I-H20b	4.343	0.835	1.180	Yes
					I-H13a	2.129	0.802	1.109	Yes					
					I-H13b	2.866	0.850	1.155	Yes					
					I-H14a	2.895	1.035	1.359	Yes					
					I-H14b	3.098	0.935	1.252	Yes					

4.4.3 Factor analyses

The CFA is a well validated construct and this technique was utilised as the primary source of analyses. However, this research conducted the EFA calculations on each cluster of hypotheses. The following sections will present the outcomes from both EFA and CFA calculations. To reduce the length of this chapter, the tables that document EFA findings are not included in this chapter. Instead, they were included in Annexure C.

Factor reduction procedures were initially performed using principal components extraction methods EFA on half the total datasets. After examining the initial component rotation matrix tables, the processes were repeated with the varimax rotation method. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy measure score, the Bartlett's Test of Sphericity, the number of components and eigenvalue were documented in the following tables. The reliability statistics were also conducted to ascertain that the Cronbach's Alpha value for each new factor is reliable. Thereafter, the CFA process was carried out by fixing the number of new factors uncovered by EFA and deploying the Principle Axis Factoring feature.

4.4.4 Factor analyses of "Rate Self" surveying approach

The following sub-sections describe the outcome from the factor analysis procedures of RAU, ST and TMX cognitive-behavioural clusters for the "Rate Self" surveying approach. The aim of these sections is to produce a framework for data obtained from the "Rate Self" surveying approach and this framework can be adopted as the structural path model for further PLS-SEM analyses.

4.4.4.1 Rate Self: Resource acquisition and utilisation cognitive-behavioural cluster

The EFA uncovered that there were three underlying factors for the RAU cluster. Each of the six initial hypotheses consists of two measurable items. The new factors cover at least 71.323% of the total variance. The KMO and Bartlett's Test produced acceptable results (KMO = 0.850, χ^2 = 286.82 and p = 0.000). The values indicated that all preliminary factors are deemed reliable. The findings from the initial EFA assessment suggest that there are three underlying factors presented in this cluster. H1: management input can merge with H2: intra-organisational connection. Similarly, H3: external perspectives and H4: customers involvement can be condensed into one factor, and H5: expansive ecosystem and H6: integrative combination can further be considered as one factor. This reduction was then tested with CFA technique. The outcome of the EFA total variance explained and the dimensionality of RAU cluster from "Rate Self" surveying approach can be found in Tables C.1 and C.2 in Annexure C.

The CFA technique covered 62.096% of the total variance. The total variance extracted can be examined in Table 4.8. The rotational component matrix of the RAU cognitive-behavioural cluster of "Rate Self" surveying approach can be examined. The correlation matrix suggested that the maximum level of shared variances is low, and the convergent validity is acceptable. The communality table revealed that all items higher than 0.4 (ranging from 0.461 to 0.721) is the extent to which an item correlates with all other items. The values of Cronbach's Alpha, CRI and communality for the factor extracted are also included in Table 4.9. These values indicate that the factor reduction procedure was a successful one.

Table 4.8 CFA total variance explained of RAU cluster from "Rate Self" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.565	46.375	46.375	5.212	43.430	43.430	2.728	22.732	22.732
2	1.867	15.561	61.936	1.446	12.051	55.481	2.527	21.060	43.792
3	1.127	9.388	71.323	0.794	6.615	62.096	2.196	18.304	62.096
4	0.614	5.121	76.444						
5	0.588	4.897	81.341						
6	0.520	4.336	85.677						
7	0.473	3.940	89.618						
8	0.349	2.911	92.529						
9	0.338	2.814	95.343						
10	0.223	1.859	97.202						
11	0.171	1.421	98.624						
12	0.165	1.376	100.000						

Table 4.9 CFA results of RAU cluster from "Rate Self" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	Cronbach α	CRI	Communality
H1	I1a-RS			0.809	0.796	0.802	0.679
	I1b-RS			0.750			0.594
H2	I2a-RS			0.571			0.581
	I2b-RS			0.647			0.551
H3	I3a-RS	0.750			0.886	0.846	0.704
	I3b-RS	0.783					0.739
H4	I4a-RS	0.734					0.646
	I4b-RS	0.775					0.701
H5	I5a-RS		0.694		0.839	0.813	0.658
	I5b-RS		0.719				0.642
H6	I6a-RS		0.774				0.701
	I6a-RS		0.720				0.656

Based on these findings, this research proposes the following three cognitive-behavioural factors to SEM investigation. In an attempt to prevent unnecessary confusion between the hypotheses and the new factors derived from the dimensional reduction of datasets obtained from "Rate Self" surveying approach, a postfix of "RS" is included in these new factors. The new factors are termed:

- F1-RS: Internal contribution (condense Hypotheses H1 and H2)

- F2-RS: External stakeholder involvement (condense Hypotheses H3 and H4)
- F3-RS: Expansive combination (condense Hypotheses H5 and H6)

4.4.4.2 Rate Self: Strategic thinking cognitive-behavioural clusters

This cluster consists of eight preliminary hypotheses and they are H7: intent focused, H8: a systems perspective, H9: thinking-in-time, H10: intelligent opportunism, H11: hypothesis-driven, H12: effectual reasoning, H13: challenge biases and H14: credulous reflectivity. The EFA reduced these initial hypotheses into only five factors. While H7 and H12 both remained as standalone factors, H8 and H9, as well as H10 and H11, were reduced to two factors. The new factors of the EFA study cover 69.72% of the total variance. The KMO and Bartlett's Test produced acceptable findings (KMO = 0.844, p = 0.000). The outcome of the EFA total variance explained and the dimensionality of RAU cluster from "Rate Self" surveying approach can be found in Tables C.3 and C.4 in Annexure C.

This preliminary dimensionality produced from EFA was then used as the fixed number of factors for CFA extraction. The Principal Axis Factoring extraction method of the CFA technique covered 63.079% of the total variance. Acceptable values were found after the KMO measurement and Bartlett's Test of Sphericity were conducted with a ρ value less than 0.005 (0.000). The communalities values for ST cluster from the "Rate Self" surveying approach range are all above 0.4, thus indicating an adequate amount of the variance in the variable that has been extracted by the factor analysis. The average loading values are higher than the variance extracted. The

Cronbach's Alpha values are all above the 0.7 threshold. The CRI and communality values appear to be acceptable as well (refer to Table 5.10).

Table 4.10 CFA total variance explained of ST cluster from "Rate Self" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.863	30.391	30.391	4.534	28.339	28.339	2.790	17.436	17.436
2	2.796	17.472	47.863	2.438	15.236	43.574	2.654	16.590	34.026
3	1.931	12.068	59.931	1.681	10.508	54.082	2.342	14.639	48.666
4	1.654	10.336	70.267	1.384	8.651	62.733	1.675	10.468	59.134
5	1.037	6.484	76.750	0.704	4.399	67.133	1.280	7.999	63.079
6	0.705	4.406	81.157						
7	0.620	3.877	85.034						
8	0.479	2.994	88.028						
9	0.376	2.347	90.375						
10	0.326	2.038	92.413						
11	0.257	1.606	94.019						
12	0.237	1.484	95.503						
13	0.215	1.345	96.848						
14	0.198	1.238	98.086						
15	0.166	1.037	99.123						
16	0.140	0.877	100.000						

Table 4.11 CFA results of ST cluster from "Rate Self" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Cronbach α	CRI	Communality
H7	I7a-RS	0.794					0.846	0.770	0.578
	I7b-RS	0.789							0.531
H8	I8a-RS			0.784			0.844	0.898	0.557
	I8b-RS			0.824					0.680
H9	I9a-RS			0.847					0.702
	I9b-RS			0.858					0.716
H10	I10a-RS		0.802				0.702	0.873	0.668
	I10b-RS		0.769						0.633
H11	I11a-RS		0.827						0.714
	I11b-RS		0.782						0.634
H12	I12a-RS					0.876	0.737	0.871	0.658
	I12b-RS					0.880			0.749
H13	I13a-RS				0.850		0.781	0.884	0.720
	I13b-RS				0.858				0.707
H14	I14a-RS				0.770				0.628
	I14b-RS				0.757				0.618

In addition, Table 4.11 confirms that the data sets for this cluster consist of 5 factors from the 8 hypotheses. The Cronbach's Alpha values and CRI are also deemed to be acceptable. The following factors will be subject to SEM investigation. To continue with the previous coding sequence, they are:

- F4-RS: Intent focused (Hypothesis H7)
- F5-RS: Temporal systems perspective (Hypotheses H8 and H9)
- F6-RS: Hypothesis-driven opportunism (Hypotheses H10 and H11)
- F7-RS: Effectual reasoning (Hypothesis H12)
- F8-RS: Concerted unbiasing (Hypotheses H13 and H14)

4.4.4.3 Rate Self: Team member exchange cognitive-behavioural cluster

The exploratory factor reduction analysis uncovered that there were four underlying factors for the TMX cluster obtained from the "Rate Self" surveying approach. These new factors accounted for 74.343% of the total variance (refer to Table C.5 in Annexure C). The six cognitive-behavioural factors proposed in the initial concept, *viz*, H15: shared leadership, H16: informal accountability, H17: disciplined delivery, H18: positive transfer, H19: constructive conflicts and H20: idea inclusivity, were reduced to four factors. The KMO and Bartlett's Test scores were found to be acceptable. Four dimensions were uncovered from the EFA analysis. The loading values and CRI obtained can be examined in Table C.6 in Annexure C.

The CFA factor dimensionality was fixed to 4. The total variance explained is 64.011% and the output of the calculation is documented in Table 4.12. The relevant factor pattern matrix can be examined in Table 4.13. Relatively adequate scores are found from the KMO scores (0.742) and Bartlett's Test (373.912) with a ρ value smaller than 0.05 (0.00). These values infer that the reduction process is successful. The low level of intercorrelation of items from different factors further concurs that these factors are indeed independent of one another based on the "Rate Self" surveying approach. An adequate amount of variance has been extracted as the CFA was carried out since all communalities observed are higher than 0.4.

Table 4.12 CFA total variance explained of TMX cluster from "Rate Self" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.021	41.844	41.844	4.657	38.812	38.812	2.284	19.029	19.029
2	1.485	12.372	54.216	1.240	10.337	49.148	2.242	18.687	37.717
3	1.263	10.522	64.739	0.992	8.264	57.413	1.592	13.269	50.986
4	1.153	9.604	74.343	0.792	6.598	64.011	1.563	13.025	64.011
5	0.714	5.951	80.294						
6	0.589	4.911	85.205						
7	0.504	4.198	89.403						
8	0.337	2.808	92.211						
9	0.283	2.355	94.566						
10	0.237	1.972	96.538						
11	0.218	1.817	98.355						
12	0.197	1.645	100.000						

Table 4.13 shows that the loading values of the items appeared to be acceptable. Additionally, the Cronbach's Alpha values exceed the acceptance threshold of 0.7. Similarly, the CRI for all factors is also above 0.7 and the communalities are very much above 0.4. All these values suggest the suitability of the extracted factors. In addition, findings suggested that the shared variance extracted for all factors are higher than the correlation square root of AVE, and thus demonstrated that the discriminant validity is established.

The above-stated findings infer that the six cognitive-behavioural hypotheses are condensed into 4 factors and this dimensionality can be subjected to SEM calculations. By continuing with the numbering from the previous section, the factors are termed as:

- F9-RS: Shared leadership (Hypothesis H15)
- F10-RS: Dutiful diligence (Hypotheses H16 and H17)
- F11-RS: Positive engagement (Hypotheses H18 and H19)
- H12-RS: Idea inclusivity (Hypothesis H20)

Table 4.13 CFA results of TMX cluster from "Rate Self" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	Factor 4	Cronbach α	CRI	Communality
H15	I15a-RS				0.849	0.878	0.834	0.756
	I15b-RS				0.844			0.777
H16	I16a-RS	0.801				0.838	0.786	0.708
	I16b-RS	0.782						0.697
H17	I17a-RS	0.645						0.684
	I17b-RS	0.523						0.648
H18	I18a-RS		0.798			0.809	0.763	0.711
	I18b-RS		0.748					0.637
H19	I19a-RS		0.539					0.577
	I19b-RS		0.571					0.533
H20	I20a-RS			0.839		0.880	0.824	0.781
	I20b-Rs			0.836				0.771

Factor Analyses of "Rate Team" surveying approach

The following sections describe the outcome from the factor analysis procedures of RAU, ST and TMX cognitive-behavioural clusters for the "Rate Team" surveying approach. The aim of these sections is to produce a structural path diagram for data obtained from the "Rate Team" surveying approach and this diagram will be subjected to further PLS-SEM analyses.

4.4.5.1 Rate Team: Resource acquisition and utilisation cognitive-behavioural cluster

The findings from the CFA concur with the outcome of the reduction calculation from EFA with the exception of minor differences in the rankings of the factors. Six hypotheses from the RAU cluster from “Rate Team” surveying approach were further reduced to four underlying factors and these new factors cover 66.781% of the overall variance extracted (refer to Tables C.7 and C.8 in Annexure C). The pattern matrix and correlation matrix revealed that H1: management input and H2: intra-organisational connection can be reduced into one factor. Similarly, H3: external perspectives and H4: customers involvement can be merged into another while H5: expansive ecosystem and H6: integrative combination can also be integrated into another. The calculation shows that the KMO value is 0.807 and the p-value is 0.000, which indicates that the EFA was effective. In addition, the EFA uncovered that there are three underlying factors in this dataset, similar to the ones obtained from the “Rate Self” surveying approach. The pattern matrix can also be examined in Table C.8 in Annexure C.

CFA calculation was carried out by fixing the underlying data dimensionality as 3. The overall variance extracted and the pattern matrices can be viewed in Tables 4.14 and 4.15. An acceptable fitting range of communalities values of the CFA was found, and all values are higher than 0.5. The KMO and Bartlett's Test of Sphericity values where sufficiently high. The ρ value is less than 0.05 (0.00). In addition, the discriminant validity is satisfied considering that the shared variance extracted for all factors are higher than the correlation square root of AVE.

Table 4.14 CFA total variance explained of RAU cluster from "Rate Team" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.680	39.002	39.002	4.269	35.577	35.577	3.253	27.111	27.111
2	2.133	17.776	56.778	1.742	14.517	50.094	2.300	19.165	46.276
3	1.482	12.352	69.130	1.242	10.353	60.447	1.701	14.171	60.447
4	0.755	6.290	75.420						
5	0.724	6.037	81.456						
6	0.482	4.013	85.469						
7	0.390	3.252	88.721						
8	0.340	2.830	91.551						
9	0.323	2.694	94.245						
10	0.299	2.495	96.740						
11	0.241	2.004	98.745						
12	0.151	1.255	100.000						

Table 4.15 CFA results of RAU cluster from "Rate Team" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	Cronbach α	CRI	Communality
H1	I1a-RT			0.759	0.846	0.826	0.531
	I1b-RT			0.738			0.506
H2	I2a-RT			0.799			0.530
	I2b-RT			0.746			0.588
H3	I3a-RT		0.828		0.886	0.832	0.695
	I3b-RT		0.835				0.621
H4	I4a-RT		0.796				0.513
	I4b-RT		0.788				0.481
H5	I5a-RT	0.806			0.885	0.808	0.690
	I5b-RT	0.806					0.711
H6	I6a-RT	0.816					0.717
	I6a-RT	0.819					0.621

The postfix of "RT" represents that these new factors are derived from the "Rate Team" surveying approach. Factors F1-RT to F3-RT are then deployed to guide the construction of a new RAU structural path that was utilised for the SEM calculation. These factors are termed in a similar way as the factors uncovered from the "Rate Self" surveying approach, and they are:

- F1-RT: Internal contribution (Hypotheses H1 and H2)
- F2-RT: External stakeholder involvement (Hypotheses H3 and H4)
- F3-RT: Expansive combination (Hypotheses H5 and H6).

4.4.5.2 Rate Team: Strategic thinking cognitive-behavioural cluster

The EFA procedures attempt to reduce the same eight hypotheses and they are H7: intent focused, H8: a systems perspective, H9: thinking-in-time, H10: intelligent opportunism, H11: hypothesis-driven, H12: effectual reasoning, H13: challenge biases and H14: credulous reflectivity. However, this reduction exercise reveals a slightly different pattern than the ones produced by the "Rate Self" surveying approach. The outcome of the analyses proposes that H7 remains as a standalone factor, H8 and H9, as well as H13 and H14 can pair up to form two new factors. Another discovery is that H10, H11 and H12 are condensed into the same dimension and form one factor. The factor extraction conducted by EFA covered 70.579% of the total data (refer to Table C.9 in Annexure C). The KMO measure revealed 0.839, Bartlett's Test of Sphericity showed the Chi-Square and ρ value are both acceptable. The pattern matrix and loading values can be found in Table C.10 in Annexure C.

The CFA procedure commenced by fixing the total factors to be extracted as 4. A high level of 67.880% of the total variance was extracted with the CFA technique (Refer to Table 4.16). The newly extracted factors, along with their respective loading, Cronbach's Alpha, CRI and commonality values can be found in Table 4.17. These values are deemed acceptable as they are all above their respective acceptance threshold. In addition, the discriminant validity is satisfied judging by the shared variance extracted for all factors are higher than the correlation square root of AVE.

Table 4.16 CFA total variance explained of ST cluster from "Rate Team" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.888	36.798	36.798	5.483	34.269	34.269	3.174	29.837	29.837
2	2.047	12.791	49.590	1.696	10.600	44.869	2.593	16.208	46.045
3	1.804	11.276	60.866	1.530	15.564	60.434	2.547	11.920	57.965
4	1.554	9.713	70.579	1.191	9.445	69.879	1.586	9.915	67.880
5	0.831	5.194	75.773						
6	0.657	4.105	79.878						
7	0.563	3.520	83.398						
8	0.423	2.642	86.040						
9	0.377	2.359	88.399						
10	0.318	1.990	90.389						
11	0.307	1.918	92.307						
12	0.281	1.758	94.065						
13	0.274	1.712	95.777						
14	0.247	1.545	97.323						
15	0.220	1.376	98.698						
16	0.208	1.302	100.000						

Table 4.17 CFA results of ST cluster from "Rate Team" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	Factor 4	Cronbach α	CRI	Communality
H7	I7a-RT				0.884	0.887	0.870	0.792
	I7b-RT				0.871			0.776
H8	I8a-RT		0.797			0.862	0.838	0.707
	I8b-RT		0.696					0.558
H9	I9a-RT		0.759					0.637
	I9b-RT		0.748					0.623
H10	I10a-RT	0.673				0.855	0.841	0.572
	I10b-RT	0.649						0.513
H11	I11a-RT	0.741						0.591
	I11b-RT	0.724						0.587
H12	I12a-RT	0.659						0.485
	I12b-RT	0.659						0.514
H13	I13a-RT			0.841		0.844	0.845	0.742
	I13b-RT			0.756				0.628
H14	I14a-RT			0.745				0.617
	I14b-RT			0.692				0.557

Overall, the findings once again indicate that the underlying data structures of the dataset obtained from the “Rate Team” surveying approach are slightly more than the data structures of the dataset obtained from the “Rate Self” surveying approach. The outcome of factor analyses suggested that these latent variables can be included when constructing the structural path model for ST cluster with “Rate Team” surveying approach. The following factors will thus be subjected to SEM investigation:

- F4-RS: Intent focused (Hypothesis H7)
- F5-RS: Temporal systems perspective (Hypotheses H8 and H9)
- F6-RS: Effectual opportunism (Hypotheses H10, H11 and H12)
- F7-RS: Concerted unbiasing (Hypotheses H13 and H14)

4.4.5.3 Team member exchange cognitive-behavioural cluster

The EFA revealed the six cognitive-behavioural factors proposed in the initial concept (H15: shared leadership, H16: informal accountability, H17: disciplined delivery, H18: positive transfer, H19: constructive conflicts and H20: idea inclusivity) were reduced to three factors for the dataset of TMX cluster obtained from the “Rate Team” surveying approach. These new factors accounted for 69.130% of the total variance (refer to Table C.11 in Annexure C). The KMO and p-values are deemed acceptable. The pattern matrix further shows how these hypotheses are condensed into three factors and the loading values appear to be satisfactory (refer to Table C12 in Annexure C). The number of underlying dimensions uncovered by EFA were then deployed for the CFA calculation.

Table 4.18 CFA total variance explained of TMX cluster from "Rate Team" approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.680	39.002	39.002	4.269	35.577	35.577	3.253	27.111	27.111
2	2.133	17.776	56.778	1.742	14.517	50.094	2.300	19.165	46.276
3	1.482	12.352	69.130	1.242	10.353	60.447	1.701	14.171	60.447
4	0.755	6.290	75.420						
5	0.724	6.037	81.456						
6	0.482	4.013	85.469						
7	0.390	3.252	88.721						
8	0.340	2.830	91.551						
9	0.323	2.694	94.245						
10	0.299	2.495	96.740						
11	0.241	2.004	98.745						
12	0.151	1.255	100.000						

Table 4.18 describes the percentage of the total variance extracted of the CFA procedure. The total variance explained is equal to 66.87%, which is believed to be sufficient. The pattern matrix, loading value, Cronbach's Alpha, CRI and communalities can be found in Table 4.19.

Table 4.19 CFA results of TMX cluster from "Rate Team" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	Cronbach α	CRI	Communality
H15	I15a-RT			0.858	0.819	0.850	0.834
	I15b-RT			0.862			0.851
H16	I16a-RT		0.770		0.847	0.818	0.777
	I16b-RT		0.770				0.733
H17	I17a-RT		0.694				0.585
	I17b-RT		0.674				0.757
H18	I18a-RT	0.729			0.749	0.874	0.565
	I18b-RT	0.720					0.553
H19	I19a-RT	0.764					0.599
	I19b-RT	0.753					0.592
H20	I20a-RT	0.709					0.530
	I20b-RT	0.715					0.527

Apart from that the KMO measurement (0.807) and p-value (0.000) both look promising, the range of communality values and CRI are both above the acceptable thresholds. Overall, the loading value appeared to be satisfactory. The magnitude of Cronbach's Alpha values is also above the respective acceptance criteria.

Once again, the latent variable proposed from the CFA using the data obtained from the "Rate Team" surveying approach produced a slightly different reduction pattern than the factors extracted from the data of the "Rate Self" surveying approach. The above-stated findings infer that the following extracted six cognitive-behavioural factors can be subjected to PLS-SEM calculation. By continuing with the numbering from the previous section, the factors are:

- F8-RT: shared leadership (i.e. H15),
- F9-RT: dutiful diligence (i.e. H16 + H17), and
- F10-RT: positive community (i.e. H18 + H19 + H20).

4.4.6 Defining structural path models for two surveying approaches

Overall, datasets obtained from the "Rate Team" surveying approach generated a different reduction pattern than those factors extracted from the data of the "Rate Self" surveying approach. This concurs with findings from previous descriptive statistics sections that these two surveying approaches are different.

In addition, the above factor analyses confirmed that the factors extracted can be utilised to form the latent variables and subsequently propose the relevant structural path models. The conceptual structural path model for each of the surveying approaches is presented in Figures

4.2 and 4.3. All observable factors are identified as reflective items. These structural path models will be utilised for the PLS-SEM as the basis to validate the initial hypotheses of this thesis.

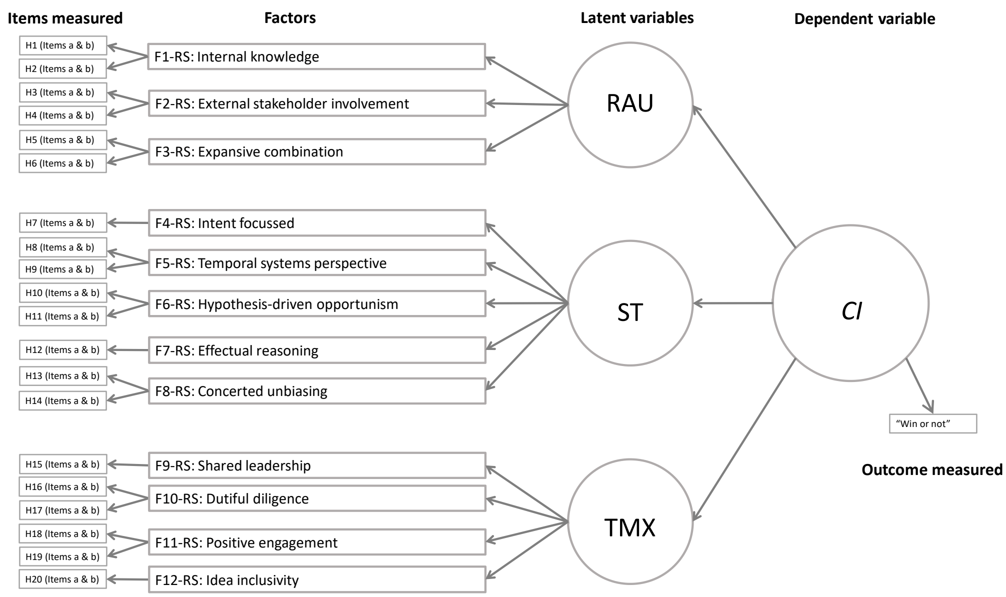

Figure 4.2 Preliminary structural path model for PLS-SEM testing: datasets obtained from "Rate Self" surveying approach (author's own)

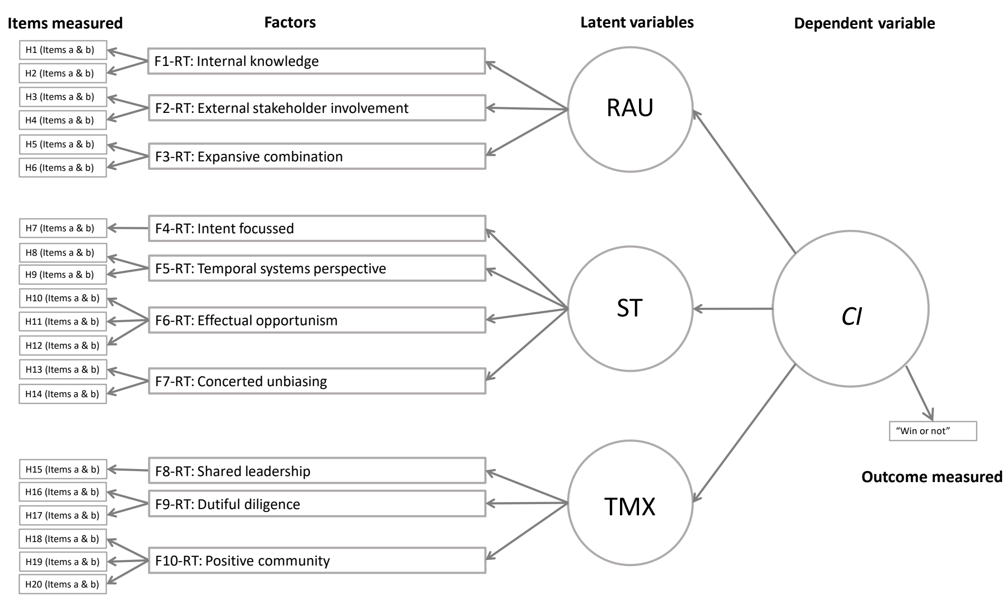

Figure 4.3 Preliminary structural path model for PLS-SEM testing: datasets obtained from "Rate Team" surveying approach (author's own)

4.4.7 Structural equation modelling

This section aims to present the outcomes of the SEM calculations performed on the two structural path models obtained from the previous section. After an evaluation of different multivariate data analysis techniques, the predefined structural path models (Figures 4.2 and 4.3) with strong theoretical basis were established and deemed applicable for further hypothesis testing. SEM was then considered to be the most suitable multivariate technique for the next step of the research.

After the initial Smart PLS calculations were performed, the findings divulged that factors F4-RS and F4-RT did not meet the model-fit criteria for each of the structural path models. These two factors stem from the hypothesis H7: intent focused. Therefore F4-RS and F4-RT were deleted from each model and the calculations were then repeated. The following sections discuss the model fit and predictability of the “Rate Self” and “Rate Team” surveying approaches

4.4.7.1 Goodness-of-fit

After the initial PLS-SEM calculations were performed, this research had to modify the preliminary models obtained from the factor analyses by removing Hypothesis 7: Intent Focused and construct the structural models for both “Rate Self” and “Rate Team” surveying approaches owing to various GoF values being outside of the acceptance thresholds.

After reconstructing the structure path models, the "Rate Self" model produced a SRMR of 0.098 whereas the equivalent model from the Rate Team" surveying method indicated a SRMR value of 0.086. From the SRMR point of view, the fit for both models appeared to be acceptable. In SEM, R^2 evaluates the degree of variation accounted for in the endogenous constructs by the exogenous constructs (Falk & Miller, 1992; Moksony, 1990).

Tables 4.20 (for "Rate Self" datasets) and 4.21 ("Rate Team" datasets) included the Cronbach's Alpha, rho-A, composite reliability index and AVE, which validate the construct reliability and validity of the structural path models for both surveying approaches. It is worth-noting that as suggested by (Fornell & Larcker, 1981), the AVE value above 0.4 can be accepted for large models where the CRI values are high, such as findings for the latent variables in this case.

Table 4.20 Select GoF values for structural path models of "Rate Self" surveying approach

	Description	**Cronbach's σ**	**rho_A**	**CRI**	**AVE**	f^2	Q^2
Latent variables	*CI*→RAU	0.839	0.843	0.872	0.464	0.058	0.047
	C →ST	0.889	0.912	0.922	0.430	0.065	0.046
	CI→TMX	0.870	0.887	0.892	0.480	0.074	0.041
RAU	RAU→F1-RS	0.800	0.804	0.869	0.625	0.910	0.287
	RAU→F2-RS	0.844	0.852	0.895	0.681	1.129	0.351
	RAU→F3-RS	0.892	0.904	0.932	0.774	1.278	0.423
ST	ST→F5-RS	0.890	0.901	0.930	0.770	1.792	0.482
	ST→F6-RS	0.877	0.878	0.915	0.730	3.064	0.538
	ST→F7-RS	0.809	0.810	0.913	0.839	1.176	0.446
	ST→F8-RS	0.874	0.874	0.914	0.726	0.874	0.327
TMX	TMX→F9-RS	0.892	0.928	0.962	0.927	0.462	0.284
	TMX→F10-RS	0.865	0.867	0.908	0.711	1.107	0.365
	TMX→F11-RS	0.869	0.869	0.910	0.717	2.516	0.502
	TMX→F12-RS	0.819	0.819	0.917	0.846	1.451	0.493

The f^2 and Q^2 values of the inner models of both structural path diagrams were calculated. All f^2 values were found to fall within the acceptance range (Chin, 1998; Cohen 1992). Additionally, since the Q^2 values uncovered were reliably higher than zero, the predictive relevance of both diagrams was fulfilled (Chin, 1998). The outer VIF values can be found in Table 4.22.

Table 4.21 Select GoF values for structural path models of "Rate Team" surveying approach

	Description	Cronbach's σ	rho_A	CRI	AVE	f^2	Q^2
Latent variables	*CI*→RAU	0.771	0.788	0.825	0.492	0.104	0.061
	C →ST	0.890	0.891	0.907	0.415	0.104	0.057
	CI→TMX	0.854	0.855	0.882	0.489	0.115	0.063
RAU	RAU→F1-RT	0.760	0.783	0.845	0.578	0.378	0.146
	RAU→F2-RT	0.825	0.833	0.884	0.655	1.018	0.320
	RAU→F3-RT	0.877	0.878	0.916	0.730	1.147	0.380
ST	ST→F5-RT	0.866	0.867	0.909	0.714	1.272	0.390
	ST→F6-RT	0.868	0.869	0.901	0.603	3.226	0.449
	ST→F7-RT	0.871	0.871	0.912	0.721	0.954	0.342
TMX	TMX→F8-RT	0.891	0.913	0.958	0.919	0.430	0.269
	TMX→F9-RT	0.837	0.839	0.891	0.672	1.105	0.345
	TMX→F10-RT	0.875	0.875	0.906	0.616	2.627	0.435

The above-stated measurements indicate that the model is fit for use. Even though model fit cut-off indices only provide a guideline for establishing whether the hypothesised model is adequately grounded in the observed data and good model fit may not always guarantee validity of research results, in this case the result appeared to be relatively satisfactory. All HTMT values fall within the acceptable range. These values concur that further studies can be carried out to unpack the relations and validate these relations against the research hypotheses (Refer to Tables 4.23 and 4.24). Based on the ascertainment of appropriate model fit of the measurement model, the latent constructs were used for the creation of a structural path model in order to test the hypotheses of this thesis.

Table 4.22 VIF values for model obtained from both surveying approaches

"Rate Self"						"Rate Team"					
RAU-RS		ST-RS		TMX-RS		RAU-RT		ST-RT		TMX-RT	
Item	VIF	Item	VIF	Item	VIF	Item	VIF	Item	VIF	Item	VIF
H1a-RS	2.088	H8a-RS	2.072	H15a-RS	2.642	H1a-RT	1.457	H8a-RT	2.393	H15a-RT	2.364
H1b-RS	1.825	H8b-RS	2.416	H15b-RS	2.688	H1b-RT	1.403	H8b-RT	2.015	H15b-RT	2.484
H2a-RS	1.416	H9a-RS	2.227	H16a-RS	2.926	H2a-RT	1.617	H9a-RT	2.245	H16a-RT	2.471
H2b-RS	1.460	H9b-RS	2.449	H16b-RS	2.686	H2b-RT	1.489	H9b-RT	2.123	H16b-RT	2.443
H3a-RS	2.753	H10a-RS	2.505	H17a-RS	1.924	H3a-RT	2.189	H10a-RT	2.409	H17a-RT	1.977
H3b-RS	2.979	H10b-RS	2.138	H17b-RS	1.641	H3b-RT	1.988	H10b-RT	2.254	H17b-RT	1.903
H4a-RS	2.543	H11a-RS	2.403	H18a-RS	2.226	H4a-RT	1.755	H11a-RT	2.160	H18a-RT	2.119
H4b-RS	2.748	H11b-RS	2.129	H18b-RS	2.064	H4b-RT	1.632	H11b-RT	2.179	H18b-RT	2.067
H5a-RS	1.971	H12a-RS	1.414	H19a-RS	1.447	H5a-RT	2.657	H12a-RT	2.078	H19a-RT	2.036
H5b-RS	2.115	H12b-RS	1.414	H19b-RS	1.536	H5b-RT	2.433	H12b-RT	2.173	H19b-RT	1.974
H6a-RS	2.222	H13a-RS	2.020	H20a-RS	2.676	H6a-RT	2.225	H13a-RT	2.652	H20a-RT	2.057
H6b-RS	2.111	H13b-RS	1.986	H20b-RS	2.699	H6b-RT	2.044	H13b-RT	2.229	H20b-RT	1.931
		H14a-RS	1.378					H14a-RT	2.132		
		H14b-RS	1.414					H14b-RT	1.886		

Table 4.23 HTMT values for both "Rate Self" surveying methods

	CI	F01-RS	F02-RS	F03-RS	F04-RS	F05-RS	F06-RS	F07-RS	F08-RS	F09-RS	F10-RS	F11-RS	RAU	ST	TMX
CI															
F01-RS	0.244														
F02-RS	0.135	0.395													
F03-RS	0.344	0.299	0.308												
F04-RS	0.046	0.305	0.345	0.295											
F05-RS	0.172	0.245	0.263	0.428	0.631										
F06-RS	0.254	0.253	0.151	0.323	0.508	0.784									
F07-RS	0.050	0.272	0.236	0.180	0.436	0.477	0.412								
F08-RS	0.188	0.312	0.237	0.117	0.371	0.218	0.220	0.202							
F09-RS	0.243	0.251	0.197	0.275	0.563	0.549	0.490	0.335	0.399						
F10-RS	0.239	0.266	0.196	0.383	0.451	0.469	0.465	0.175	0.308	0.436					
F11-RS	0.247	0.298	0.189	0.335	0.412	0.425	0.438	0.144	0.358	0.374	0.815				
RAU-RS	0.133	0.837	0.837	0.754	0.526	0.563	0.481	0.465	0.282	0.635	0.722	0.783			
ST-RS	0.188	0.619	0.584	0.827	0.845	0.869	0.649	0.831	0.384	0.635	0.560	0.534	0.833		
TMX-RS	0.193	0.824	0.587	0.595	0.539	0.621	0.494	0.544	0.641	0.767	0.754	0.709	0.838	0.814	

Table 4.24 HTMT values for both "Rate Team" surveying methods

	CI	F01-RT	F02-RT	F03-RT_	F04-RT	F05-RT	F06-RT	F07-RT	F08-RT	F09-RT	RAU-RT	ST-RT	TMX-RT
CI													
F01-RT	0.151												
F02-RT	0.126	0.249											
F03-RT	0.381	0.114	0.213										
F04-RT	0.170	0.238	0.291	0.229									
F05-RT	0.260	0.195	0.164	0.378	0.562								
F06-RT	0.065	0.217	0.133	0.116	0.350	0.490							
F07-RT	0.168	0.220	0.210	0.084	0.326	0.179	0.130						
F08-RT	0.051	0.184	0.149	0.213	0.509	0.498	0.273	0.359					
F09-RT	0.294	0.197	0.171	0.348	0.400	0.453	0.154	0.287	0.381				
RAU-RT	0.306	0.819	0.809	0.796	0.432	0.439	0.249	0.282	0.334	0.405			
ST-RT	0.221	0.296	0.277	0.344	0.843	0.819	0.813	0.265	0.453	0.446	0.480		
TMX-RT	0.285	0.288	0.257	0.371	0.463	0.454	0.271	0.632	0.760	0.776	0.481	0.597	

4.4.7.2 Hypotheses testing

As stated in the previous section, this research had to modify the preliminary models obtained from the factor analyses by removing Hypothesis 7: Intent Focused and construct the structural models for both "Rate Self" and "Rate Team" surveying approach.

The findings as the results of PLS-SEM calculations show that the model fit appears to be adequate for both preliminary path models. The calculations further concurred that 19 out of the original 20 were accepted when examining the different datasets obtained from "Rate Self" and "Rate Team" surveying approaches.

Causalities in structural model paths can only be established via a model that can adequately reproduce the data without requiring further adjustment or re-specification. The path coefficients (β) can be applied to measure the effects of each relationship of the structural model covering total effects (direct and indirect effects). These indicators provide clues on the direct effects of a variable assumed to be a cause on one that is assumed to be an effect. In essence a path analysis is an extension of the regression model. The β values are standardised versions of linear regression weights, which can be used in examining the possible causal linkage between statistical variables in the SEM approach. The β values for both models are captured in Table 4.25.

The R^2 values for both the outer and inner models of both structural path diagrams appeared to be satisfactory considering that this research falls within the boarder scope of social science (Falk & Miller, 1992; Moksony, 1990) and they are also included in the Table 4.25. The same table also indicate that the t-statistics and p-value are both acceptable.

The outer model for each structural path diagram consists of observable variables and the inner model consists of latent variables that are formed by these observable variables. The path coefficients and t-values ($p < 0.05$) were calculated. The calculation for each respective path diagram indicates that the three relationships (between the RAU, ST and TMX clusters) with *CI* seemed to be correlated. However, there are differences between those obtained from the "Rate Self" surveying approach and the ones from the "Rate Team" surveying approach. The new structural path models for the two datasets obtained from different survey approaches are captured in Figures 4.4 and 4.5.

Table 4.25 Models of "Rate Self" and "Rate Team" surveying approaches: t-statistics, p-value and β

Path	β	t-statistics	ρ-value	R^2	Factor (Hypothesis/es)
"Rate Self"					
CI **→ RAU**	0.104	2.654	0.008	0.113	
CI **→ ST**	0.114	2.224	0.027	0.119	
CI **→ TMX**	0.140	3.529	0.000	0.149	
RAU → F1-RS	0.690	14.825	0.000	0.475	F1-RS: Internal contribution (H1 + H2)
RAU → F2-RS	0.728	17.775	0.000	0.529	F2-RS: External stakeholder involvement (H3 + H4)
RAU → F3-RS	0.749	15.979	0.000	0.560	F3-RS: Expansive combination (H5 + H6)
ST → F5-RS	0.801	11.759	0.000	0.641	F5-RS: Temporal systems perspective (H8 + H9)
ST → F6-RS	0.868	15.884	0.000	0.753	F6-RS: Hypothesis-driven opportunism (H10 + H11)
ST → R7-RS	0.735	16.062	0.000	0.539	F7-RS: Effectual reasoning (H12)
ST → R8-RS	0.683	15.884	0.000	0.465	F8-RS: Concerted unbiasing (H13 + H14)
TMX → F9-RS	0.562	11.044	0.000	0.314	F9-RS: Shared leadership (H15)
TMX → F10-RS	0.725	19.122	0.000	0.524	F10-RS: Dutiful diligence (H16 + H17)
TMX → F11-RS	0.846	13.199	0.000	0.715	F11-RS: Positive engagement (H18 + H19)
TMX → F12-RS	0.769	13.051	0.000	0.591	H12-RS: Idea inclusivity (H20)
"Rate Team"					
CI **→ RAU-RT**	0.157	3.596	0.002	0.146	
CI **→ ST-RT**	0.160	4.230	0.002	0.141	
CI **→ TMX**	0.158	5.181	0.000	0.151	
RAU-RT → F1-RT	0.524	6.105	0.000	0.273	F1-RT: Internal contribution (H1 + H2)
RAU-RT → F2-RT	0.710	9.637	0.000	0.503	F2-RT: External stakeholder involvement (H3 + H4)
RAU-RT → F3-RT	0.731	7.879	0.000	0.533	F3-RT: Expansive combination (H5 + H6)
ST-RT → F5-RT	0.848	13.471	0.000	0.559	F5-RT: Temporal systems perspective (H8 + H9)
ST-RT → F6-RT	0.874	19.885	0.000	0.763	F6-RT: Effectual opportunism (H10 + H11 + H12)
ST-RT → F7-RT	0.699	18.482	0.000	0.487	F7-RT: Concerted unbiasing (H13 + H14)
TMX → F8-RT	0.549	10.304	0.000	0.299	F8-RT: Shared leadership (H15)
TMX → F9-RT	0.725	11.355	0.000	0.524	F9-RT: Dutiful diligence (H16 + H17)
TMX → F10-RT	0.851	8.505	0.000	0.724	F10-RT: Positive community (H18 + H19 + H20)

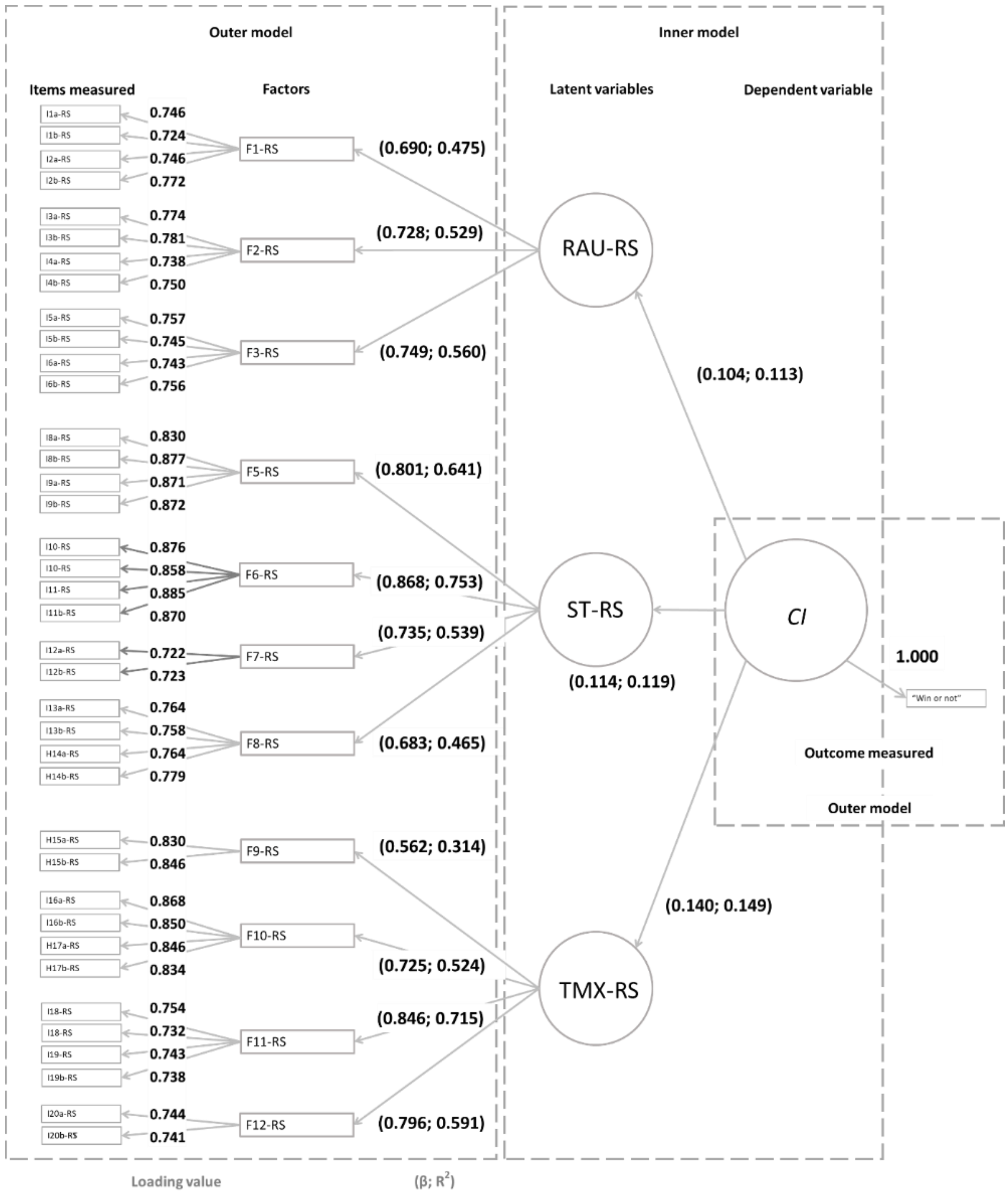

Figure 4.4 Final model of datasets obtained from the "Rate Self" surveying approach (Loading values, β and R^2, author's own)

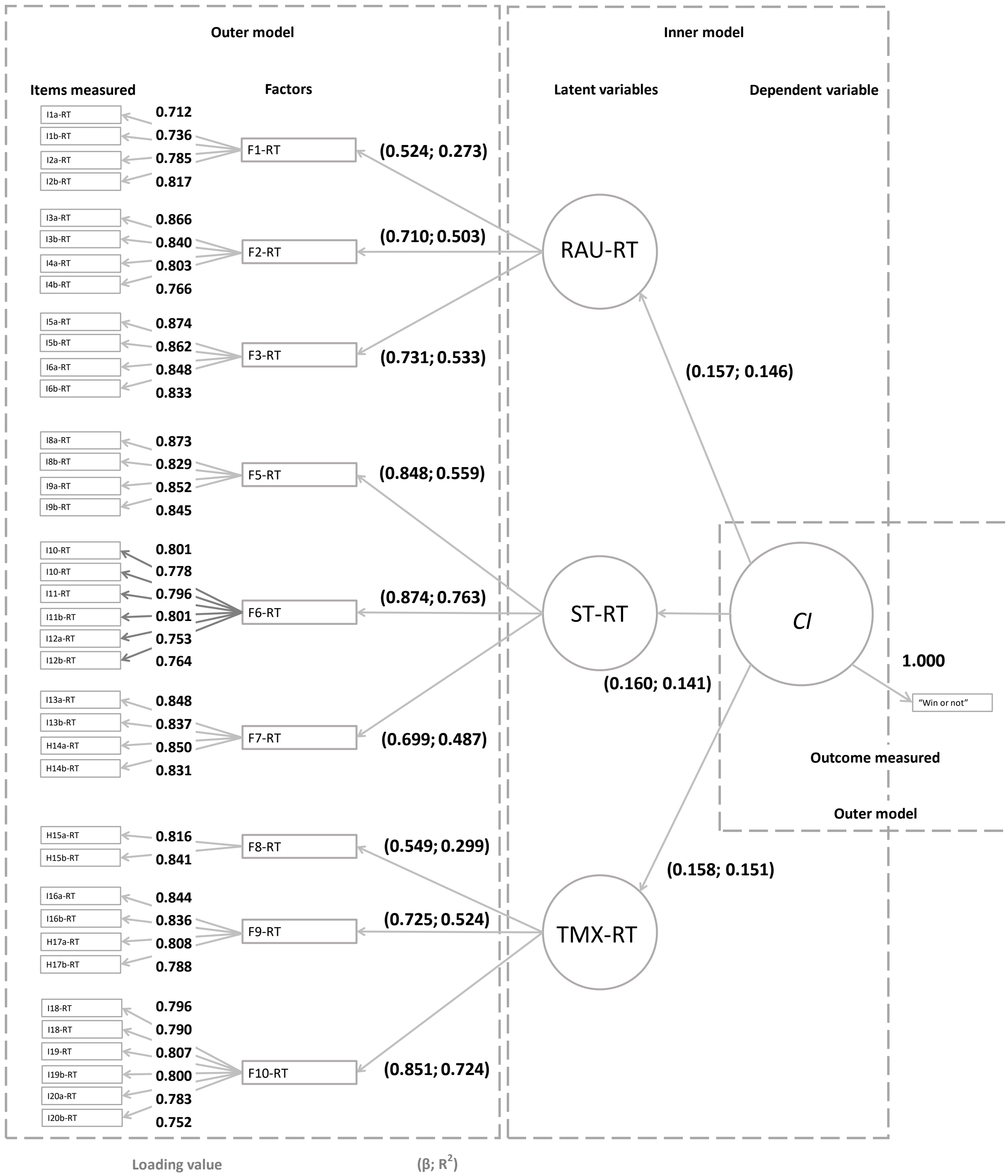

Figure 4.5 Final model of datasets obtained from the "Rate Team" surveying approach (Loading value, β and R^2, author's own)

Typically, to accept a hypothesis using PLS-SEM requires the path coefficients to be higher than 0.1 with t-values greater than 1.96 at $p < 0.05$ level (Hair Jr, Hult, Ringle & Sarstedt, 2016). Even though, the R^2 values were on the lower scale considering that the nature of this research falls within the social science domain. These values are deemed acceptable according to the suggestions by Falk and Miller (1992), and Moksony (1990), who posit that a small R^2 value equal to or greater than 0.10 can be accepted, especially when key values, such as HTMT, rho_A, CRI and AVE, are all deemed acceptable. In fact, these values are comparable with some of the existing *CI* studies (Kim et al., 2017). It is also worth noting that the (AVE) cut-off threshold can accept value as from 0.4, if the CRI is higher than 0.6 (Fornell & Larcker, 1981).

4.4.7.3 Latent variables

Based on the Figures 4.4 and 4.5, it is apparent that "Rate Self" and "Rate Team" surveying approaches generate slightly different outcomes. For datasets obtained from "Rate Self" surveying approach, participants appeared to rank TMX cluster as the most influential cluster of cognitive-behaviours towards the level of *CI* within the teams ($\beta = 0.140$), with a medium explanatory power ($R^2 = 0.149$), followed by the ST cognitive-behavioural cluster ($\beta = 0.114$), with a slightly lower (medium) explanatory power ($R^2 = 0.119$). Lastly, the RAU cognitive-behavioural cluster also shows positive-relations with *CI* of the team ($\beta = 0.104$), with an even lower explanatory power ($R^2 = 0.113$).

The outcomes from the datasets of "Rate Team" surveying approach somewhat differ from findings obtained from the datasets of "Rate Self" surveying approach. All three clusters appeared to exhibit similar impact to the *CI* (RAU: $\beta = 0.157$, ST: $\beta = 0.160$ and TMX: $\beta = 0.158$).

Their respective R^2 values are also similar (RAU: $R^2 = 0.146$, ST: $R^2 = 0.141$ and TMX: $R^2 = 0.151$) and these values show an acceptable explanatory power.

Overall, the key insight of the two structural path model differ from one another. While the model generated from the “Rate Self” surveying approach demonstrate that TMX cognitive-behaviours influence the *CI* of the ALP teams more than others, the model generated from the “Rate Team” surveying approaches regards all three RAU, ST and TMX cognitive-behaviours to hold similar importance.

4.4.8 Comparing structural path models

Based on the findings presented, apart from H_0 of the Hypothesis 7, the remaining H_0 of the hypotheses proposed in Chapter 2 are all supported after the inferential statistics was performed. The t-value of these 19 hypotheses appeared to be within the acceptance level and they are higher than 1.96 at $p < 0.05$ with path coefficients higher than 0.1 (Hair Jr et al., 2016).

However, irrefutably the degree of the relationship strength between the cognitive-behavioural factors and *CI* can be found. The differences between the datasets obtained from “Rate Self” and “Rate Team” surveying approaches are small but noticeable. Based on Table 4.26, it appeared that the “Rate Team” surveying approach is slightly more superior than the “Rate Self” surveying approach. A detailed discussion will be offered in Chapter 5.

The two structural path models (Figures 4.5 and 4.6) further indicate that “Rate Self” and “Rate Team” models exhibit *seven* factors in common and these factors covered 13 out of 19 hypotheses accepted (H1, H2, H3, H4, H5, H6, H8, H9, H13, H14, H15, H16 and H17). These factors are termed as follows:

- Internal contribution (H1 + H2),
- External stakeholder involvement (H3 + H4),
- Expansive combination (H5 + H6),
- Temporal systems perspective (H8 + H9),
- Concerted unbiasing (H13 + H14),
- Shared leadership (H15), and
- Dutiful diligence (H16 + H17).

These structural path models also demonstrate that some differences exist when it comes to the factors covering the remaining 6 hypotheses (H10, H11, H12, H18, H19 and H20). For “Rate Self” surveying approach, these 6 hypotheses can be condensed to 4 factors and they are as follows:

- F6-RS: Hypothesis-driven opportunism (H10 + H11),
- F7-RS: Effectual reasoning (H12),
- F11-RS: Positive engagement (H18 + H19) and
- H12-RS: Idea inclusivity (H20).

In contrast, the datasets obtained from the “Rate Team” surveying approach show that the patterns for the 6 hypotheses (H10, H11, H12, H18, H19 and H20) share resemblance and can be condensed into 2 factors. These factors are as follows:

- F6-RT: Effectual opportunism (H10 + H11 + H12) and
- F10-RT: Positive community (H18 + H19 + H20).

The following sections will briefly deliberate all of the factors for both models. In particular, the enhancement effect and explanatory power of factors will be discussed and contrasted between the two structural path models. The key observations and interpretations for the following subsections (4.5.6.1 to 4.5.6.9) will be discussed in the relevant sections in Chapter 5.

4.4.8.1 Common factor 1: Internal contribution

The PLS-SEM calculation concurred that both $H1_0$ (*Management inputs*) and $H2_0$ (*Intra-organisational connectio*n) should be accepted when using the datasets from either "Rate Self" and "Rate Team" surveying methods. When one examines the datasets of the "Rate Self" surveying approach, the PLS-SEM calculations revealed that this factor, *internal contribution*, contributes towards the strength of the latent variable, RAU cognitive-behaviour cluster, with a reasonable enhancement effect (β = 0.690). The explanatory power is deemed acceptable (R^2 =0.475). Similarly, using the datasets obtained from the "Rate Team" surveying approach to examine the relationship between this factor and the same latent variable showed that there is a less but still reasonable causal relation with the latent variable (β = 0.524). The explanatory power was found to be weaker (R^2 = 0.273). The "Rate Self" surveying approach is deemed to produce a better prediction than the "Rate Team" surveying approach.

4.4.8.2 Common factor 2: External stakeholder involvement

This factor encompasses the original hypotheses of H3 (*External perspectives)* and H4 (*customers' involvement*). The PLS-SEM calculations suggested that both $H3_0$ and $H4_0$ can be accepted. In addition, the findings indicate the existence of a positive causal relation between this factor and the RAU cognitive-behavioural latent variable, for both datasets obtained from the "Rate Self" and "Rate Team" surveying approaches. The "Rate Self" surveying approach data shows that the causal relation is positive and high ($\beta = 0.728$) with a satisfactory explanatory power ($R^2 = 529$). In comparison, a marginally lower causal relationship was detected ($\beta = 0.710$), with recommendable explanatory power ($R^2 = 0.503$), which was observed when examining the datasets obtained from the "Rate Team" surveying approach. The "Rate Self" surveying approach is deemed to produce a better prediction than the "Rate Team" surveying approach.

4.4.8.3 Common factor 3: Expansive combination

This factor consists of two original hypotheses and they are H5: *expansive ecosystem* and H6: *purposeful integration*. The PLS-SEM calculation concurred that both $H5_0$ and $H6_0$ should be accepted for both sets of data (i.e. "Rate Self" and "Rate Team" surveying approaches). When one examines the datasets of "Rate Self" surveying approach, calculations show that this factor contributes towards the strength of the latent variable, RAU cognitive-behaviour cluster, with a significant enhancement effect ($\beta = 0.749$) and a recommendable explanatory power ($R^2 = 0.560$). These figures are comparable with the *CI* enhancement ($\beta = 0.731$) and explanatory power ($R^2 = 0.533$) if the datasets obtained from the "Rate Team" surveying approach.

4.4.8.4 Common factor 4: Temporal systems perspective

This factor covers two original hypotheses and they are H8: *systems perspective* and H9: *thinking-in-time*. The findings indicate that there is a degree of causality between this factor and the RAU cognitive-behavioural latent variable irrespective of using the datasets from either surveying approaches. However, the "Rate Self" surveying approach data shows that this factor has a moderate degree of influence towards the ST cognitive-behavioural latent variable (β = 0.801) with a high explanatory power (R^2 = 0.641). Similarly, in comparison with the "Rate Team" surveying approach data, the *temporal systems perspective* factor shows a good causal relationship with the ST cluster (β = 0.848) and the explanatory power of this relationship is slightly higher in comparison (R^2 = 0.559). In this case, the "Rate Team" surveying approach appears to be a more effective predictor than the "Rate Self" surveying approach.

4.5.6.5 Common factor 5: Concerted unbiasing

This factor covers two original hypotheses and they are H13: *credulous reflexivity* and H14: *challenging biases*. The findings of this research suggest that both $H13_0$ and $H14_0$ can be accepted. When one examines the dataset of the "Rate Self" surveying approach, the PLS-SEM calculations revealed that the *concerted unbiasing* factor has a low contribution towards the strength of the RAU cluster (β = 0.683) with acceptable explanatory power (R^2 = 0.465) which leads to an enhancement of *CI* of the ALP team. Similarly, when using the datasets obtained from the "Rate Team" surveying approach to examine the relationship between this factor and the RAU cluster, a moderate positive effect of causality was found (β = 0.699). The explanatory power was marginally higher than the one from the "Rate Self" surveying approach (R^2 = 0.487).

4.5.8.6 Common factor 6: Shared leadership

The factor represents Hypothesis H15. When one examines the dataset of the “Rate Self” surveying approach, the PLS-SEM calculations revealed that the *shared leadership* factor contributes much less towards the overall strength of the RAU cluster than other factors (β = 0.562). The explanatory power appeared to be acceptable but much lower than the others (R^2 = 0.314). Similarly, when using the datasets obtained from the “Rate Team” surveying approach to examine the relationship between this factor and the RAU cluster, a higher causality was found (β = 0.549). The explanatory power was deemed to be low (R^2 = 0.299).

4.5.8.7 Common factor 7: Dutiful diligence

The factor analyses and PLS-SEM concur that the factor, termed *dutiful diligence*, was of relatively high importance to the ST cognitive-behavioural latent variable which in turn positively contributed towards the overall magnitude of *CI* of the ALP teams. This factor consists of the original hypotheses H16: *informal accountability* and H17: *disciplined delivery*. The path coefficient of the datasets obtained from the “Rate Self” surveying approach indicate that this *dutiful diligence* plays a recommendable contribution (β = 0.725) towards the overall strength of the ST cognitive-behavioural cluster. The explanatory power was deemed acceptable (R^2 = 0.524). When evaluated, the datasets obtained from the “Rate Team” surveying approach, *dutiful diligence* contributes towards the strength of the ST cluster in a more meaningful way (β = 0.725) and the explanatory power was also high (R^2 = 0.524).

4.5.8.8 Difference one

The first noticeable difference is around the underlying data structures of hypotheses H10: intelligent opportunism, H11: hypothesis-driven, H12: effectual reasoning. The datasets of the “Rate Self” surveying approach reveal that hypotheses H10, H11 and H12 possess two underlying structures and the factors are termed *Hypothesis-driven opportunism* (that covers H10 and H11) and *effectual reasoning* (that covers H12), respectively. In comparison, when probing the underlying data structures of the datasets obtained from the “Rate Team” surveying approach, the same three hypotheses exhibit only one common dimensionality and thus they are categorised as one factor, termed as *effectual opportunism.*

The PLS-SEM calculations indicate that *Hypothesis-driven opportunism* and *effectual reasoning* exhibit slightly different effects on the ST cognitive-behavioural cluster when it comes to datasets obtained from the “Rate Self” surveying approach. The path coefficients are somewhat similar to each other (β = 0.868, and β = 0.735, respectively) and each of the factors produce a recommendable explanatory power (R^2 values are 0.763 and 0.539, correspondingly). Based on these findings, the research can only deduce that while many teams may have exercised effectual reasoning, without asserting effective hypotheses and smartly leverage opportunities, the effectuation process may not lead to the desired impact for the teams.

Contrary, the datasets of the “Rate Team” surveying approach indicate that there is only one dimensionality when it comes to delegates’ input for hypotheses H10, H11 and H12. This sole factor is then termed *effectual opportunism*. Compared to other factors, *effectual opportunism* exhibits the highest magnitude of positive causal relationships with the ST cognitive-behavioural cluster considering it produced a high path coefficient (β = 0.874) and with a reasonable explanatory power (R^2 = 0.763). It appears that *CI* is well-associated with how teams exercise *effectual opportunism.*

4.5.6.9 Difference two

The second noticeable difference is around underlying data structures of hypotheses H18: positive transfer, H19: constructive conflicts and H20: idea inclusivity.

Once again, similar to the first noticeable difference, the datasets of the “Rate Self” surveying approach reveal that hypotheses H18, H19 and H20 possess two underlying structures. These two factors are termed *positive engagement* (that covers H18 and H19) and *idea inclusivity* (that covers H20). In comparison, when probing the underlying data structure of the datasets obtained from the “Rate Team” surveying approach, the same three hypotheses exhibit only one common dimensionality and they were thus categorised as one factor, termed as *positive community.*

When it comes to datasets obtained from the “Rate Self” surveying approach, the PLS-SEM calculations indicate that both *positive engagement* and *idea inclusivity* hold a fairly notable effect on the TMX cognitive-behavioural cluster. In fact, these two factors possess two of the strongest path coefficients in the model (β = 0.846, and β = 0.769, respectively), and both factors are found to have a high explanatory power (R^2 values are 0.715 and 0.591, correspondingly). However, even though the datasets of the “Rate Team” surveying approach indicate that there is only one dimensionality when it comes to delegates’ input for hypotheses H18, H19 and H20, the path coefficient of this factor is still high up in its ranking compared to other factors. This sole factor is then termed *positive community* and exhibits a somewhat strong positive causal relationship with the ST cognitive-behavioural cluster considering its path coefficient (β) is 0.851. The explanatory power of this factor is deemed to be high (R^2 = 0.724).

4.5 Chapter conclusion

This chapter provided a detailed overview of how the empirical dataset of this thesis was prepared for quantitative testing. It began with a summary on data collection, preparation and response rate. A set of descriptive statistics were then performed on these datasets. Apart from the fact that the data quality is deemed acceptable for further testing, the findings posit that the structure of the dataset of the "Rate Self" surveying approach is different from the one obtained from the "Rate Team" surveying approach. The outcomes provided the background for the inferential statistics. After conducting factor analyses in the order of EFA followed by CFA, the respective preliminary structural path model for "Rate Self" and "Rate Team" surveying approaches were formulated. These path diagrams were then subjected to the SEM calculation using PLS-SEM technique. Findings supported the H_0 of the 20 initial research hypotheses. The comparison of the suitability of "Rate Self" and "Rate Team" surveying approaches was made. A detailed discussion of the results and the hypothesised conceptual model will be offered in Chapter 5.

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter will draw on the results from Chapter 4 and the relevant theoretical underpinnings to generate insights and explanations. The discussions will refer back to the research statements and hypotheses formulated for testing. Finally, a short chapter conclusion will be included. The flow and the key components of this chapter are captured in Figure 5.1.

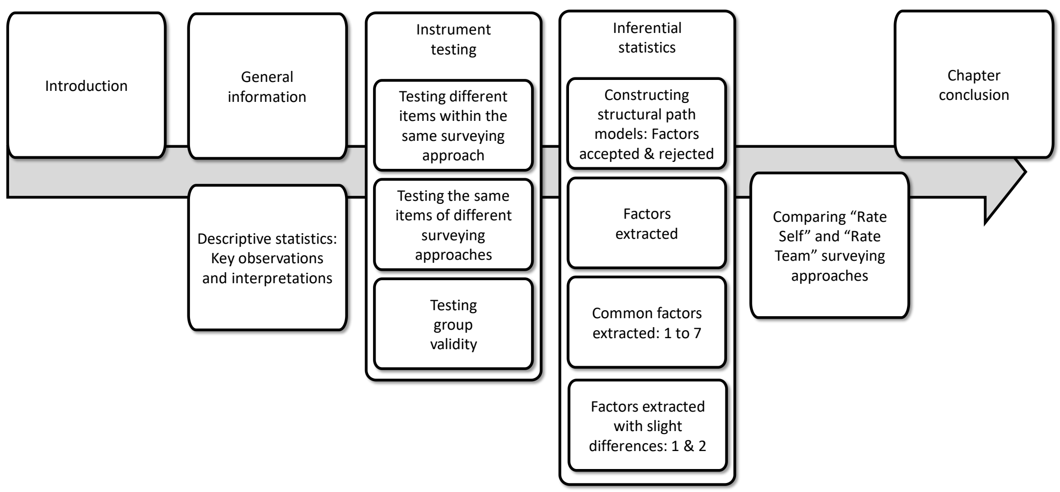

Figure 5.1 The flow and the key components of Chapter 5 (author's own)

5.2 General information

Section 4.2.1 reported the total number of delegates invited to participate in this study (745 delegates), the number of actual respondents incorporated for the study (406 delegates) and response usage rate (54.50%). The response usage was deemed acceptable (Baruch & Holtom 2008), and this response rate is partly owing to the result of the pre-screening process imposed when selecting the appropriate programme for data collection. These 406 delegates who took part in the research came from 12 CEE programmes, which represented five major industries (Table 4.1). Thus, the results imply that the generalisability of the findings is adequate, and it is likely that the results can be extrapolated to other industries in South Africa.

Section 4.2.1 also indicated the total number of the delegates in the “Win Only” and “Not Win” groups are 69 and 302 delegates, respectively. Despite the fact that a large sample size of participants comes from the “Not Win” teams, the robustness of the PLS-SEM should be able to handle the dataset well (Hair et al., 2006).

5.3 Descriptive statistics: Key observations and interpretations

Table 5.1 summarises the statistics captured in Tables 4.2, 4.3 and 4.4 and compares the descriptive statistics of the three cognitive-behavioural clusters obtained from both surveying approaches.

Table 5.1 Comparing the descriptive statistics

Cluster	“Rate Self”				“Rate Team”				“Rate Self” – “Rate Team”			
	M	σ	Kurtosis	Skewness	μ	σ	Kurtosis	Skewness	Δ_{μ}	Δ_{σ}	$\Delta_{Kurtosis}$	$\Delta_{Skewness}$
RAU	6.158	0.931	-0.250	-0.885	5.544	1.083	-0.076	-0.606	0.614	-0.153	-0.175	-0.279
ST	6.178	0.910	-0.221	-0.883	5.348	1.259	-0.258	-0.553	0.830	-0.349	0.036	-0.331
TMX	6.223	0.889	-0.279	-0.869	5.229	1.344	-0.167	-0.571	0.994	-0.455	-0.204	-0.613

Based on Table 5.1, the following key observations and interpretations can be made:

Firstly, the table shows that all the average means (μ) are above the mid-point of the Likert 7-point scale. It seems that the majority of the delegates regard the cognitive-behaviours exhibited by their teams and team are all above average. The negatively skewed statistics suggest that the tailedness of all items resided on the left side of the distribution, which further supports this observation. This implies that all delegates considered both their teams and they have applied these cognitive-behaviours well throughout the ALP journey. Superiority bias, also known as illusory superiority, can be the possible psychological phenomena which account for this observation. Superiority bias is the human cognitive-behaviours that affect individuals to rate themselves more favourably (Hornsey, 2003; Kruger, 1999). At the personal level, superiority bias results in individuals overestimating their own capabilities (Brown, 1986; Dunning, Johnson, Ehrlinger & Kruger, 2003).

Secondly, upon a closer examination, the statistics show that survey participants ranked their own cognitive-behaviours slightly higher than the collective cognitive-behaviours of their teams. These findings are not entirely a surprise seeing that it is uncommon to come across studies that advocate an individual's tendency to rank their groups higher than how they rank themselves (Jourden & Heath, 1996). Majority of the studies have suggested that individuals tend to rate themselves more favourably than when they rate their teams or groups (Brown, 1986; Dunning et al., 2003; Hornsey, 2003; Kruger, 1999; Meier & O'Toole Jr, 2013; Schmidt, Berg & Deelman, 1999; Svenson, 1981).

Thirdly, the average means of the three cognitive-behavioural clusters obtained from the "Rate Self" surveying approach do not deviate as much as the similar average means obtained from the "Rate Team" surveying approach. This observation infers that delegates regarded their own cognitive-behaviours more alike with each other. But when they reflected upon the collective cognitive-behaviours of their teams, their opinions varied a lot more. However, based on the descriptive statistics, it is unclear if this observation is as the result of one’s own bias (Brown, 1986; Cunningham & Turk, 2017; Meier & O'Toole Jr, 2013) or if one of the surveying approaches permit a more objective reflection of the actual event. This disparity may be an interesting topic for future research.

Lastly, Table 5.1 shows that the order of magnitude of Δ_{μ} is TMX (0.994) > ST (0.831) > RAU (0.615) and the order of magnitude of Δ_{σ}, values is TMX (-0.455) > ST (-0.349) > RAU (-0.175). In other words, the highest degree of the difference and deviation between the two datasets obtained from “Rate Self” and “Rate Team” surveying approaches are found to reside in the TMX cognitive-behaviours.

Despite that the above-stated observations provide limited conclusive insights towards addressing the central purpose of this research, they do allow one to deduce that the datasets generated from “Rate Self” and “Rate Team” surveying approaches are different. Moreover, these findings further suggested that these three cognitive-behavioural clusters do not exhibit the same property.

5.4 Instrument testing

Reliability and consistency measures were deployed to assess the items within the same hypothesis per each surveying approach. Subsequently, the same measures were utilised to compare similar items across two different surveying approaches. The observations and interpretations are deliberated in the following subsections (5.4.1 and 5.4.2).

5.4.1 Testing different items within the same surveying approach

The first objective of the instrument testing was to examine whether the items within a hypothesis per survey approach remain reliable and consistent with each other. Table 4.6 demonstrates that the Cronbach's α values for all items under each hypothesis fall within the acceptable range. The finding suggested that the internal consistency of the items per cognitive-behavioural hypothesis is adequate.

5.4.2 Testing the same items of different surveying approaches

The second objective of calculating the consistency is to gain clues on whether both surveying approaches lead to datasets with similar underlying structures. The datasets of the same items but obtained from two different surveying approach were subjected to a series of internal consistency calculations, and the findings are included in Table 4.7. An unacceptable level of Cronbach's α values was observed for all calculations. This observation suggests that there is a difference in how participants evaluated their individual cognitive-behaviours (i.e. “Rate Self” surveying approach) compared to how they see the general cognitive-behaviours of their respective teams (i.e. “Rate Team” surveying approach).

5.5 Inferential statistics

Despite some intriguing insights being established in sections 4.2, 4.3 and 544, descriptive statistics and instrument testing are only useful in assisting researchers to gain a better comprehension of certain aspects of the data and the instrument itself. They are inadequate in assisting this study to ascertain the causal relationships between the variables of interest. The sections below discuss the key observations and interpretations from the findings of the inferential statistics.

5.5.1 Common method bias and independent samples t-testing the group validity

The findings of common method biases analyses (Section 4.4.3) affirm that the instrument is fit for use. The independent samples t-test (Section 4.4.2) demonstrate that the datasets obtained from questionnaire items representing hypotheses 1 (management input), 2 (intra-organisational connection), 3 (external perspectives) and 4 (customers' involvement) that do not show a statistical difference between the two surveying approaches in contrast to the datasets from the remaining questionnaire items. This observation suggests that the levels of proclivity regarding how individuals and their respective teams acquire data from different stakeholders are not too different despite that more delegates believed that they had performed better than their team members when it comes to gathering relevant resources and information. However, these similarities cannot provide the necessary insights concerning if how these hypotheses may affect the CI of the ALP team, nor which surveying approach is more superior.

5.5.2 Constructing structural path models: Factors accepted and rejected

Both EFA and CFA were carried out to explore, reduce and confirm the dimensionality of the datasets obtained from both "Rate Self" and "Rate Team" surveying approaches. Subsequently, this study made use of the factor dimensionalities confirmed, as illustrated in Figures 4.1 and 4.2, the structural path models for the PLS-SEM calculations. The findings suggest that while 19 out of the 20 hypotheses are accepted, one of the most interesting insights obtained from the PLS-SEM calculations is that factors F4-RS for "Rate Self" surveying approach and "F4-RT for "Rate

Team" surveying approach were both rejected. Both of these new factors extracted from the factor analysis calculations are directly associated with the original Hypothesis 7: Intent focused. After the initial PLS-SEM calculations were performed, this research had to modify the preliminary models obtained from the factor analyses and construct the structural models for both "Rate Self" and "Rate Team" surveying methods.

Intent focused is one of Liedtka's five elements of strategic thinking (Liedtka, 1998). According to Liedtka, being intent focused enables incumbents to channel the energy to concentrate, to be strategically attentive and oppose distractions to achieve a goal. Norzailan, Yusof and Othman (Norzailan et al., 2016, p. 67) further highlighted that the definition of being "intent focused" is about being driven by goals and having a sense of destiny. Such a drive provides managers with a constancy of purpose in dealing with changes in the environment. It provides the long-term orientation that is anchored to the strategic intent of the firm". However, intent focused is a notion underpinned by causation logic. Strictly *per se*, it contradicts with ethos of effectuation theory (Archer, Baker & Mauer, 2009; Fisher, 2012; Sarasvathy, 2001; Valliere, 2015).

This discovery is not surprising as the ALP project teams often pivot their mental frames to modify the initial scope or pursue a new scope. At times, based on the information gathered (such as suddenly finding out that another unit in the organisation is busy implementing an endeavour similar to the ALP topic or discovering that they have made the wrong assumption right from the start) and the context at the particular moment (such as running out of time to complete the envisaged project scope or there is a change regulation or internal policies), a successful ALP project team will leverage any opportunity to navigate itself out of the challenging situation effectually. It is therefore not surprising to see that, contrary to having an intent focused outlook (Hypothesis H7), Hypotheses H10 (intelligent opportunism), H11 (hypothesis-driven) and H12 (effectual reasoning) were ranked highly on the list of factors influencing *CI*. For the "Rate Self" surveying approach, hypotheses H10 and H11 were condensed into factor termed F6-RS: Hypothesis-driven opportunism and hypothesis H12 remains as it is (F7-RS: Effectual reasoning). These two new factors were regarded as of high importance in how ALP teams build *CI* when one examines the β and R^2 captured in Figure 4.4. F6-RS scored 0.868 and 0.754, for the β and R^2, respectively. The same figure also shows the β and R^2 for F7-RS to be 0.735 and 0.539, respectively. For "Rate Team" surveying approach, hypotheses H10, H11 and H12 were condensed into one factor termed F6-RT: Effectual opportunism. The β and R^2 values for F6-RT are both high, 0.874 and 0.763, respectively, and they can be found in Figure 4.5.

As the business landscape of today is unpredictable, leaders are suggested to deploy effectual logic to increase the strategic adaptability of their organisations (Read, Dew, Sarasvathy, Song & Wiltbank, 2009; Sarasvathy et al., 2014), opportunity creation (Ghezzi, 2019) and business venturing decisions (Read, Song & Smit, 2009). With the aim to address shortcomings in literature, Valliere (Valliere, 2015) further proposed a fresh outlook to describe entrepreneurial intent. Instead of adopting the prevailing view that regards entrepreneuring as an "all-or-nothing" decision and fixated on the end result, the author advocates the intent itself must leverage effectual logics to shift or reshape its mean-goal relationship. Based on the emerging literature that strongly supports the journey of entrepreneurship, which requires effectual logic but not a rigidly focused outcome, it is not surprising that Factors F4-RS and F4-RT are both rejected.

5.5.3 Factors extracted

This research diligently applied factor analyses. Based on these factor analyses, the research findings unearthed two preliminary models when comparing the datasets obtained from the "Rate Self" surveying approach to the ones from the "Rate Team" surveying approach. These models can be examined in Figures 4.4 and 4.5. While both preliminary models share the commonality of *seven* factors (covering 14 original Hypotheses), the small differences between these two preliminary models are observed. These subtle contrasts between the models, primarily differing in the underlying dimensions of how the other six original hypotheses are structured, will be discussed in detail in the subsequent sections of this chapter. In summary, the *seven* common factors of the two preliminary models are as follows:

1) Internal contribution (Hypotheses H1 and H2),
2) External stakeholder involvement (Hypotheses H3 and H4),
3) Expansive combination (Hypotheses H5 and H6),
4) Temporal systems perspective (Hypotheses H8 and H9),
5) Concerted unbiasing (Hypotheses H13 and H14),
6) Shared leadership (Hypothesis H15), and
7) Dutiful diligence (Hypotheses H16 and H17).

In other words, the outcome for the factors within the RAU cognitive-behaviours cluster appears to be congruent irrespective of which of the two survey approaches is utilised. Carrying out intra-organisational boundary-spanning, consulting external stakeholders and exercising resourcefulness type of actions are found to be important by both "Rate Self" and "Rate Team" surveying approaches.

However, the preliminary models obtained from the "Rate Self" and "Rate Team" surveying approaches show some degrees of difference in the ST and TMX cognitive-behavioural clusters. The two sets dimensionalities of factors that exhibit some degrees of differences are:

1) The datasets within the ST cognitive-behavioural cluster revealed that, from the "Rate Self" surveying approach, hypotheses H10 and H11 were found to share one similar underlying structure and collectively were condensed as a new factor termed "*hypothesis-driven opportunism*". Hypothesis H12, *effectual reasoning*, was found to remain as it is. Contrastingly, the datasets from the "Rate Team" surveying approach divulge that hypotheses H10, H11 and H12 share a common underlying structure. These hypotheses are therefore grouped into a factor termed "*effectual opportunism*".

2) The datasets of the TMX cognitive-behavioural cluster revealed that from the "Rate Self" surveying approach, hypotheses H18 and H19 were found to share a common underlying structure and were therefore merged as a new factor termed "*positive engagement*". Hypothesis H20 was found to remain independent of other datasets within this cognitive-behavioural cluster. However, in comparison, the "Rate Team" surveying approach leads the datasets for hypotheses H18, H19 and H20 to have a similar underlying structure. The new factor is termed "*positive community*".

Table 5.1 ranks the strength of path coefficients of outer and inner models for both "Rate Self" and "Rate Team" surveying approaches. The values of explanatory power associated with the factors and latent variables are also included. More explanations will be offered in the subsequent subsections.

Table 5.2 Ranking the causal relationship between factors and *CI* using two surveying approaches

Rank	Path	β	R^2	Factor accepted (Hypotheses covered)
"Rate Self"				
Inner model				
1	***CI* → TMX**	0.140	0.149	
2	***CI* → ST**	0.114	0.119	
3	***CI* → RAU**	0.104	0.113	
Outer model				
1	**ST → F6-RS**	0.868	0.753	F6-RS: Hypothesis-driven opportunism (H10 + H11)
2	**TMX → F11-RS**	0.846	0.715	F11-RS: Positive engagement (H18 + H19)
3	**ST → F5-RS**	0.801	0.641	F5-RS: Temporal systems perspective (H8 + H9)
4	**TMX → F12-RS**	0.769	0.591	H12-RS: Idea inclusivity (H20)
5	**RAU → F3-RS**	0.749	0.560	F3-RS: Expansive combination (H5 + H6)
6	**ST → R7-RS**	0.735	0.539	F7-RS: Effectual reasoning (H12)
7	**RAU → F2-RS**	0.728	0.529	F2-RS: External stakeholder involvement (H3 + H4)
8	**TMX → F10-RS**	0.725	0.524	F10-RS: Dutiful diligence (H16 + H17)
9	**RAU → F1-RS**	0.690	0.475	F1-RS: Internal contribution (H1 + H2)
10	**ST → R8-RS**	0.683	0.465	F8-RS: Concerted unbiasing (H13 + H14)
11	**TMX → F9-RS**	0.562	0.314	F9-RS: Shared leadership (H15)
"Rate Team"				
Inner model				
1	***CI* → ST-RT**	0.160	0.151	
1	***CI* → TMX**	0.158	0.146	
1	***CI* → RAU-RT**	0.157	0.141	
Outer model				
1	**ST-RT → F6-RT**	0.874	0.763	F6-RT: Effectual opportunism (H10 + H11 + H12)
2	**TMX → F10-RT**	0.851	0.724	F10-RT: Positive community (H18 + H19 + H20)
3	**ST-RT → F5-RT**	0.848	0.559	F5-RT: Temporal systems perspective (H8 + H9)
4	**RAU-RT → F3-RT**	0.731	0.533	F3-RT: Expansive combination (H5 + H6)
5	**TMX → F9-RT**	0.725	0.524	F9-RT: Dutiful diligence (H16 + H17)
6	**RAU-RT → F2-RT**	0.710	0.503	F2-RT: External stakeholder involvement (H3 + H4)
7	**ST-RT → F7-RT**	0.699	0.487	F7-RT: Concerted unbiasing (H13 + H14)
8	**TMX → F8-RT**	0.549	0.299	F8-RT: Shared leadership (H15)
9	**RAU-RT → F1-RT**	0.524	0.273	F1-RT: Internal contribution (H1 + H2)

After a closer examination of the findings, it is important to highlight that despite finding two small differences between these two structural path models, if one artificially compartmentalises the two sets of factors into top, middle and bottom according to their rank standings for argument’s sake, one can find the similarity between the two models to be substantial when one refers to Figure 5.2 below. Figure 5.1 ranks and compares the *CI* influenceability of factors of the two models based on the path coefficients. The top 10 hypotheses with the most impact to *CI* are H5, H6, H8, H9, H10, H11, H12, H18, H19 and H20. Whereas H3, H4, H16 and H17 are found to possess slightly less influenceability to the overall *CI.* Lastly, the remaining five factors with lower least *CI*-influenceability are H1, H2, H13, H14, H15. But, in summary, all of the nineteen hypotheses have a recommendable effect on *CI*.

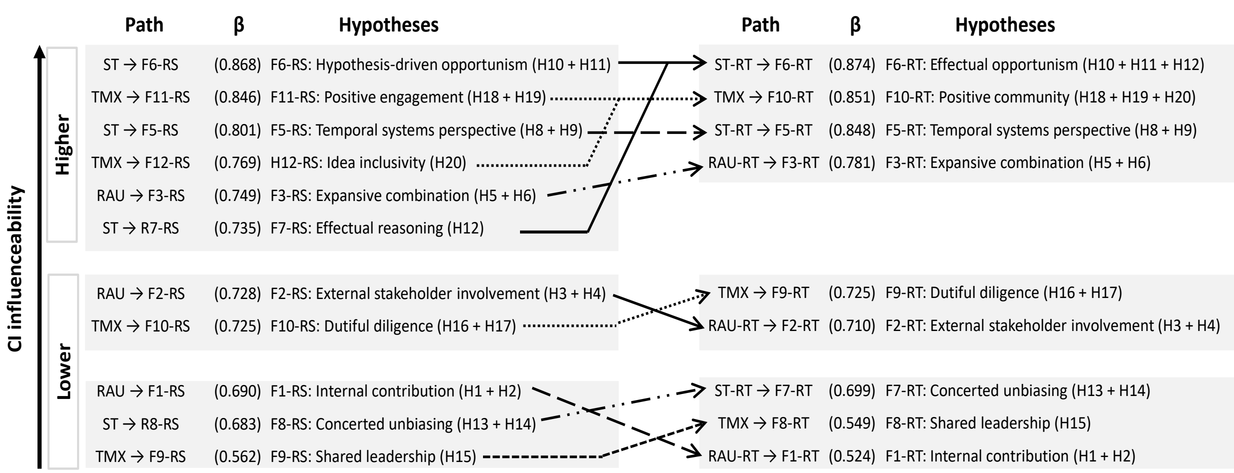

Figure 5.2 Ranking the *CI* influenceability of factors of the two models based on the path coefficients (author’s own)

5.5.4 Observations and interpretations for common factors extracted

The following factors were found in both theoretical models (Figures 4.4 and 4.5), and they were accepted after PLS-SEM calculations. The following sections aim to discuss each of these factors based on the observations made from the findings.

5.5.4.1 Common factor 1: Internal contribution

This factor, termed *internal contribution*, is defined as the act of smartly involving internal key stakeholders to advance one's progress in pursuit of a strategic goal. It covers the original hypotheses H1: *management input* (i.e. involving the senior and executive management with the purpose of gaining the relevant knowledge as a critical project resource), and H2: *intra-organisational connection* (i.e. the boundary-spanning activities to break silos and acquire resources from other organisational units).

Literature has extensively documented that gaining support from senior managers and executive is a helpful antecedent to corporate innovation (Ireland, Covin & Kuratko, 2009; Kuratko et al., 2014). Scholars have established the benefits of promoting intra-organisational partnerships across the organisational boundaries to reduce the organisational silos innovation (Dibble & Gibson, 2018; Harvey, 2017; Pick et al., 2015; Zhang & Tang, 2017). Unlocking intra-organisational knowledge synergy (Karim & Kaul, 2014) through leveraging internal social capital (Maurer, Bartsch & Ebers, 2011; Tortoriello & Krackhardt, 2017) and boundary-spanning initiatives (J. Shin & Jalajas, 2010) has a positive effect on corporate innovation.

However, the verdict concerning whether top management's knowledge input affects the *CI* of teams is still inconclusive (Viegas et al., 2016). Even though some studies have shown that top management influences an organisation's innovation (Jiang & Chen, 2018; Sipe, 2016), others believe that high performing teams do not consider the involvement of managers to be a highly important factor for the overall project success (Viegas et al., 2016). The finding of this study concurred that the while the support and knowledge from managers and peers can assist teams to harness the *CI*, it is not a robust contributor considering that *internal contribution* is featured in the lower third segment on the ranking of *CI* influenceability.

A simple explanation could be that in order to come up with an innovative business concept or solution to a problem, merely exploring what is already known is simply not enough. Even though *internal contribution* provides ALP teams with some of the essential wisdom, the teams still need to come up with striking concepts to impress the judges. Moreover, as the delegates from all ALP teams per ALP topic will probably receive similar information from their management and peers, this may account to why this factor does not impact the CI of the team as significantly as other factors. Another plausible reason as to why this *internal contribution* is ranked as one of the low impact factors on *CI* for both models may be because that all ALP processes typically have already received the support from the senior management before commencement. Therefore, the delegates may not have to work as hard to obtain the internal inputs.

5.5.4.2 Common factor 2: External stakeholder involvement

The factor, *external stakeholder involvement*, is defined as the act of involving key stakeholders outside of the organisation and familiar with the external context for the processes of value discovery, creation and capture. It encompasses the original hypotheses of H3: *external perspectives*, and H4: *customers' involvement*, and by their respective title, the hypotheses explore the importance of acquiring the understanding of external environments and the knowledge from external key stakeholders, including customers. The PLS-SEM calculation suggested that both $H3_0$ and $H4_0$ can be accepted.

In terms of the *CI* influenceability point of view, *external stakeholder involvement* is found to be a factor that influences the success of the ALP project teams more than *internal contribution*. It is not a surprising outcome. It is through critically comprehending customer needs and desires, as well as gaining new perspectives and information from a range of external parties that ALP teams can generate more innovative ideas to create new and/higher value for the customers.

These findings concurred with the theoretical postulates which state the innovativeness and profitability of the business are related to an organisation's familiarity with the external environment (Gkypali et al., 2017; Holtzman et al., 2011; Lee & Sawang, 2016; Markovic & Bagherzadeh, 2018). Spanning action outside of the organisation to gather a diverse input from external stakeholders and co-create a desirable solution has been said to increase the success of innovation (Colman & Rouzies, 2019; Kazadi et al., 2016).

It is commonly agreed that the path towards successful innovations always begins with understanding the customers' 'needs to be fulfilled', the higher purpose for which customers buy your offerings (Christensen et al., 2016). Scholars have advised that in order to achieve the desired outcome through a co-creation process, organisations must ensure that their customers are involved in the design of the solution (Chan et al., 2010; Etgar, 2008; Johansson et al., 2019; Liedtka, 2015; Liedtka & Kaplan, 2019; Markovic & Bagherzadeh, 2018; Meuter et al., 2000; Prahalad & Ramaswamy, 2004; Witell et al., 2011). ALP teams should acknowledge the importance of customer orientation in the pursuit of gratifying returns (Mukerjee, 2013). However, obtaining the right information may be imperative in the pursuit of harnessing and increasing *CI*, but the results suggest that to acquire it contextually and utilise it effectively is even more important. Hence this factor is not featured as one of the top factors that affect the *CI* of the ALP teams.

5.5.4.3 Common factor 3: Expansive combination

This factor, termed as *expansive combination*, is defined as the deliberated action of consistently and frequently seeking and acquiring more resources to support the pursuit of a goal while constantly selecting, prioritising and integrating the resources at one's disposal when attempting to utilise them. The factor consists of two original hypotheses, and they are H5: *expansive ecosystem* (i.e. to seek and acquire more resources through expanding one's ecosystem), and H6: purposeful *integration*, (i.e. the deliberateness to select, prioritise and integrate the resources at hand contextually for the purpose of value creation). In other words, H5 is about being resourceful (Bates & Flynn, 1995; Dubey, Gunasekaran, Childe, Blome & Papadopoulos, 2019; Eisenhardt & Schoonhoven, 1996) and H6 is about exercising resourcefulness (Prabhu & Jain, 2015; Williams, Zhao, George, Sonenshein & Ucbasaran, 2019; Yang & Tsai, 2019; Zehra, 2017). Despite resourcefulness being a characteristic that is frequently invoked to explain how entrepreneurial actors "find a way" to innovate, create, and turn ideas into reality, this ubiquitous concept remains an unclear area to the body of knowledge of innovation and entrepreneurship (Williams et al., 2019).

The delegates who participated in the surveying processes deemed exercising *expansive combination* as an important factor towards building the *CI* of the ALP teams. It is ranked as one of the top *CI* influencing factors for the datasets of both “Rate Self” and “Rate Team” surveying approaches (as shown in Figure 5.2). There seems to be a complementarity between the two hypotheses within this factor. Expanding the reach to acquire more relevant resources, while simultaneously filtering and smartly making use of those at hand is found to be helpful towards boosting the *CI* of the team.

The effects of being resourceful on entrepreneurship and innovation have been deliberated extensively over the past decades (Bates & Flynn, 1995; Dubey et al., 2019; Eisenhardt & Schoonhoven, 1996). Not only that being resourceful enables the aspirant innovators and entrepreneurs to produce the necessary resources to overcome the challenges at hand and seize the opportunities, it also improves the sense-making capability of these individuals (Beverland, Micheli & Farrelly, 2016; Wright, Manning, Farmer & Gilbreath, 2000).

In a complementary way, the effect of *resourcefulness* on entrepreneurship remains as an understudied area and in 2019 a highly reputable academic journal; the Journal of Business Venturing recently launched a call for papers with the intention to produce a special issue on this theme (Williams et al., 2019). Noteworthy topics such as frugal innovation (Agarwal & Brem, 2017), jugaad innovation (Prabhu & Jain, 2015; Zehra, 2017) and bricolage (Baker & Nelson, 2005; Fisher, 2012) are somewhat associated with resourcefulness. Many more intricacies still await to be exposed through empirical studies.

Exploring resourcefulness is critical, given its potential role in addressing a fundamental question of entrepreneurship. Broadly speaking, entrepreneurship can be understood as "the process by which individuals—either on their own or inside organizations—pursue opportunities", or "future situations that are both desirable and feasible" (Stevenson & Jarillo, 1990), p.23). Speaking from the perspective of effectuation (Sarasvathy, 2001), the act of exercising *resourcefulness* can be compared to the "Birds-in-Hand" and "Crazy Quilt" principles. This dynamic means-goals abductive reasoning process enables the ALP team to be highly adaptive in times of uncertainty.

These explanations could account for the reasons why this factor is ranked 5th (out of 11) and 4th (out of 9) in terms of its direct effect on *CI* corresponding to the "Rate Self" and "Rate Team" structure path models.

5.5.4.4 Common factor 4: Temporal systems perspective

This factor, *temporal systems perspective*, is defined as the act of gaining perspectives through exercising systems thinking that also incorporates the temporality dimension. It consists of two original hypotheses, and they are H8: *systems perspective* and H9: *thinking-in-time*. The findings from the previous chapter have demonstrated that it impacts the level of *CI*.

Participants positioned *temporal systems perspective* as a factor in the middle of the *CI* influenceability ranking, as suggested in Figure 5.2. It is envisaged that with the information at hand, ALP teams can envision various types of causal relations. This factor should assist the teams to predict the plausible outcomes of their current actions or forecast what other resources they need in the pursuit of significantly advancing the progress of their projects.

Over the years, scholars have asserted the importance of systems thinking for innovation (Galanakis, 2006; Jaaron & Backhouse, 2018; Smith, 2007) and entrepreneurship (Lans, Blok & Wesselink, 2014; Trivedi & Misra, 2015). The pursuit of corporate innovation and entrepreneurship typically faces different challenges. Leaders need to develop a holistic perspective of the challenge at hand and grasp the interconnectedness and interdependencies between the activities within the context (Basile et al., 2018; Castellano & Del Gobbo, 2018; Liedtka, 1998; Norzailan et al., 2016; Senge et al., 2007; Zhu et al., 2015). For example, a study conclusively attributed systems thinking as a critical factor in the success of projects based on 12 case studies of two EU innovation policies (Kapsali, 2011). Systems thinking methods were found to enable the teams to the cognitive flexibility to manage innovativeness, mitigate complexity and address uncertainty related to these innovation projects (Kapsali, 2011; Zahra & Nambisan, 2012).

When applying systemic causal effect type of reasoning, one must consider the temporality in order to prevent unnecessary complications arising from unintended wicked causal effects and the indeterministic enactment between different relevant components within the business context (Botha, 2016; Kapsali, 2011; Kunc, 2008; Norreklit, 2000; Pourdehnad, 2007; Zahra & Nambisan, 2012). Without knowing the temporal relationship of the business components and forces within the business landscape that may affect the future outcomes of an intended strategy, project teams may find themselves in a compromised position at the later stage (Kaplan & Norton, 1996; Kock et al., 2015; McKiernan, 2017; Norreklit, 2000; Roese et al., 2006; Soltanzadeh & Mooney, 2016). Temporality can be argued as an important factor for effectuation (Adegbile et al., 2017; Sarasvathy, 2001). To develop a clear understanding of the intricate relationship between the components and temporal influences becomes essential for both the ideations and implementation of innovative business concepts (Hu, Leopold-Wildburger & Strohhecker, 2017; Norreklit, 2000). Therefore thinking-in-time can be considered as part of the systems thinking as exercising the thoroughness to unpack the temporality enables leaders to formulate foresight for future events (Bandura, 2001; Bromberg et al., 2017; Hoyle & Sherrill, 2006; Sanna, 1996) and connect to the past (Bar, 2009; Elsbach, Barr & Hargadon, 2005) within the organisational context (Baron, 2000; Kahneman & Miller, 1986; Kahneman & Varey, 1990; Kaplan, 2008; Rouleau, 2005).

Despite the fact that systems thinking and thinking-in-time have been found to be highly pertinent for dealing with complex problems, individuals still tend to neglect the power of this cognitive behaviour (Capurro et al., 2018; Stompff et al., 2016; Trivedi & Misra, 2015). The findings suggest that both $H8_0$ and $H9_0$ can be accepted. These two thinking elements as hypotheses can be combined into the factor termed, *temporal systems perspective,* and the factor indirectly affects the level of *CI*.

5.5.4.5 Common factor 5: Concerted unbiasing

Within the context of this research, this factor, termed *concerted unbiasing*, is defined as an act of purposefully eradicating prejudice and blind-spots concerning how one interprets the context and progress to date. It covers two original hypotheses, and they are H13: credulous reflexivity and H14: challenging biases. The findings of this research suggest that both $H13_0$ and $H14_0$ can be accepted.

Unsurprisingly, the PLS-SEM calculations revealed that *concerted unbiasing* positively contributes to the overall *CI*, even though the extent of its influenceability is not as strong as others. It is through legitimately reviewing a team's collective frame of mind, perceptions and progress that the members of the team can find a firm anchor point to strategise the way forward. However, reducing the biases in the group and reflecting well on the past leading to the current status of the projects may not bring about profound insights to increase the innovativeness of the ALP solutions.

Human beings have a high propensity to suffer from a variety of biases (Acar, Tarakci & van Knippenberg, 2019; Kahneman & Miller, 1986; Kahneman & Varey, 1990; Liedtka, 2015; Roese et al., 2006). For example, the prevalence of the Dunning-Kruger effect has been commonly accepted, and many individuals are regularly unaware of their lack of competence to perform certain tasks well (Dunning et al., 2003). Moreover, individuals are also prone to unknowingly fall for traps into various biases (Kahneman & Miller, 1986; Kahneman & Varey, 1990). Hence, it is of significant merit for the ALP teams to habitually exercise the evidence-based practice, the decision-making and problem-solving proclivity of relying on facts rather than evidence (Aarons & Sommerfeld, 2012). The ability to exercise credulous reflexivity permits individuals to question the status quo and challenge a range of biases stems from self (Brown, 1986; Hornsby, Kuratko & Zahra, 2002; Kahneman & Miller, 1986; Kahneman & Varey, 1990; Zahra & Nambisan, 2012), team (Drach-Zahavy & Somech, 2001; Soltanzadeh & Mooney, 2016), organisation (Barnett, 2008; Jarzabkowski, Balogun & Seidl, 2007) dominant logic of others (Brem, Nylund & Schuster, 2016; Kahneman, 2011; Prahalad, 2004). The findings of this research concur with these scholarly arguments, and further posit that there is positively a relationship between this factor with the ST cognitive-behavioural latent variable which contributed to the overall level of *CI* of the ALP teams.

Scholars have suggested that teams which reflect credulously can ascertain a clear view on the progress and impediments (Mariano & Awazu, 2017; Pieterse, Van Knippenberg & van Ginkel, 2011). The effectiveness of team reflexivity has been found to play a significant role in corporate entrepreneurship and innovation (Elbanna, 2015; Leavy, 2005; Litchfield et al., 2018; Moreland & McMinn, 2010; Schippers et al., 2015; Schippers et al., 2017; Schmutz et al., 2018; Shin et al., 2017; Stompff et al., 2016). The proclivity of encouraging the leaders to justify their assumptions by seeking evidence and challenge own biases is regarded to be a vital practice toward the near-term competitiveness and future preparedness (Ross, 2019; Sull & Sull, 2018). In other words, the pursuit of entrepreneurship and innovation requires evidence-based practice (Aarons & Sommerfeld, 2012; Frese, Rousseau & Wiklund, 2014; Rauch, van Doorn & Hulsink, 2014; Tranfield, Denyer & Smart, 2003). The importance of exercising "*concerted unbiasing*" on the *CI* of the ALP teams is supported by the PLS-SEM findings. It is only through challenging one's own biases concertedly that leaders can effectively reframe their constructs, develop intelligent choices and reconcile numerous plausible strategic predictions (Bessant et al., 2014; Boone, Lokshin, Guenter & Belderbos, 2019; Graetz, 2002; Nuntamanop et al., 2013, Zahra, 2012 #282)

5.5.4.6 Common factor 6: Shared leadership

The factor termed *shared leadership* holds the same definition as was previously discussed in Hypothesis H15. It is defined as "an emergent team phenomenon whereby leadership roles and influence are distributed among team members" (Carson et al., 2007). Despite the usage of interest (Carson et al., 2007; Ensley et al., 2006; Hoch, 2013; Martin et al., 2018; Mehra et al., 2006; Morgeson et al., 2010; Pearce & Sims Jr, 2002; Wang et al., 2014), existing literature studies on shared leadership have yet to reach consensus, and the opinions of the scholars remain fragmented (Martin et al., 2018; Zhu et al., 2018).

At a glance, the level of contribution of shared leadership to *CI* may seem puzzling as it is ranked at the bottom of the *CI* influenceability list. However, the findings can be attributed to three reasons: 1) Throughout the ALP journey, each team often nominates a team leader or co-leaders to ensure that the progress of all projects is up to date. In fact, for some of the programmes, there is a formal process of nominating which member or two members should be in charge to ensure that the progress of the project is met. 2) It is quite common that one or two members of a team do more work than others. This workload asymmetry could be part of the reason why shared leadership exhibits a lesser degree of impact on *CI* than other factors. 3) On many occasions, some team members prefer executing and completing their responsibilities than leading the teams.

It is interesting to find that for both surveying approaches, *shared leadership* was one of the lowly-ranked factors in terms of the path coefficients. This is not surprising as many action learning projects often come to fruition owing to a small percentage of the team members within a project team who invest a significantly large amount of effort. This effort asymmetry can be frequently observed. Moreover, as each team typically nominates a leader during the whole journey, some individuals may be more accustomed to playing the support role than the leading role. However, in contrast, the findings of this study suggest that the level of *CI* is more significantly influenced by the action of *idea inclusivity* within the team than having to promote *shared leadership* too rigidly.

In recent years, scholars have begun to advocate that the relationship between leadership and followership is a closely interlinked continuum (Blackshear, 2004; Townsend & Gebhardt, 2003; Yung & Tsai, 2013). The importance of followership on team innovation has gradually been receiving scholarly attention (Hoegl & Muethel, 2007; Jaussi, Stefanovich & Devlin, 2008; Yung & Tsai, 2013). Despite some research suggesting that shared leadership can positively impact team innovativeness and performance, (Döös, 2015; Hoch, 2014), not all team members are innovative and creative, and wish to lead. Some may excel at performing the facilitating or supporting role to team innovation (Johnsson, 2018). Some team members may prefer to assume the roles of "idea scouts" and "idea connectors" (Camps & Marques, 2014; Whelan et al., 2011).

Therefore, not all members of the team will have the chance to take on the leading role as teamwork progresses, and, more importantly, not all have the desire to do so (Zhu et al., 2018).

In-depth investigations on the relationship between shared leadership, followership and teams that exhibit high entrepreneurial or innovative flair remain limited (Friedrich et al., 2016; Friedrich et al., 2009; Gobble, 2017; Qu, Janssen & Shi, 2017; Scott-Young et al., 2019). Future scholarly attention should be invested into unpacking the relational intricacies between shared leadership, followership and *CI*.

5.5.4.7 Common factor 7: Dutiful diligence

The factor, termed *dutiful diligence*, is defined as the effort of conscientiously fulfilling one's duty and upholding the accountability of progress making in a disciplined fashion. When compared to other factors, *dutiful diligence* is said to be of moderate importance as it is positioned in the mid-range of the *CI* influenceability ranking, as shown in Figure 5.2. This factor consists of the original Hypotheses H16: *informal accountability* (i.e. how team members influence each other to feel responsible towards certain aspects of the project and promote individual psychological ownership to develop helpful interdependent working ethos (Arain et al., 2019; Rau et al., 2018; Romzek et al., 2012), and H17: *disciplined delivery* (i.e. attempting to make progress through the systematic and methodical process (Aulet, 2013; Carroll & Richardson, 2017).

Many factors, ranging from creativity, agility and embracing constraints to risk-taking, management support, autonomy, proactiveness, and the likes, have been extensively studied and they were shown to affect the conceptualisation and delivery of successful corporate entrepreneurship and innovation (Bessant, Birkinshaw & Delbridge, 2004; Drach-Zahavy & Somech, 2001; Dupont, 2019; Euchner & Ganguly, 2014; Haught-Tromp, 2017; Herrera, 2015; Khalili, 2016; Kuratko et al., 2014; Rigby, Sutherland & Takeuchi, 2016; Sull & Sull, 2018; Terziovski & Morgan, 2006; Zairi & Al-Mashari, 2005). In contrast, more investigations should be carried out to question the effect of upholding informal accountability and affirming a disciplined approach on the innovation and entrepreneurial performance of the organisation (Hall et al., 2018; Kou & Stewart, 2018; Magpili & Pazos, 2018; Romzek et al., 2012).

The importance of practising and institutionalising a disciplined, rigorous innovation approach was advocated by fewer scholars (Herrera, 2015; Ikeda & Marshall, 2016; Jones et al., 2016; Kumar, 2009) but disputed by many (Khushalani, Smith & Howard, 1994; Nguyen & Swatman, 2006; Patterson & Zibarras, 2017; Sagiv et al., 2010; Salerno, de Vasconcelos Gomes, da Silva, Bagno & Freitas, 2015). This research demonstrated that both accountability and discipline are important for enhancing the innovation performance of the team and contributed towards the overall *CI* of the ALP teams.

One plausible explanation for the position in which this factor is ranked could be that, after all, innovation is not just about having rough concepts. It requires the teams to painstakingly advance the progress of the ALP. Innovation is not all about creativity related aspects. It is also about ensuring that disciplined actions can be carried out to translate the ideas into implementation. Without having the discipline and instituting some level of informal accountability, the pursuit of innovation will suffer (Pisano, 2019). In spite of that this research has shown the moderate importance of *dutiful diligence* on the *CI* of the ALP teams. The intricacies of how this factor can be most effectively executed and sustained require further research in the future.

5.5.5 Observations and interpretations for factors extracted with slight differences

As stated in Chapter 4, some factors have been confirmed by factor analyses and subsequently accepted by PLS-SEM calculations, but they differ slightly in the pattern matrices owing to the type of surveying approach utilised. These factors covered the original hypotheses H10: *intelligent opportunism*, H11: *hypothesis-driven* and H12: *effectual reasoning*, as well as H18: *positive transfer*, H19: *constructive conflicts*, and H20: *idea inclusivity*.

Datasets obtained from the "Rate Self" surveying approach reveal that hypotheses H10, H11 and H12 can be condensed into two factors. Similarly, hypotheses H18, H19 and H20 can be condensed into two other factors. Whereas the datasets of the "Rate Team" surveying approach indicate that H10, H11 and H12 exhibit one common data dimensionality, and similarly, H18, H19 and H20 also exhibit a common data dimensionality. Although these two differences are noticeable, they remain somewhat minor in the grand scheme of things as these six h-nulls. The following sections will provide brief discussions about these observations.

5.5.5.1 Difference one

The first noticeable difference is around the underlying data structures of hypotheses H10: intelligent opportunism, H11: hypothesis-driven, H12: effectual reasoning. The datasets of the

“Rate Self” surveying approach reveal that hypotheses H10, H11 and H12 possess two underlying structures and the factors are termed *Hypothesis-driven opportunism* (that covers H10 and H11) and *effectual reasoning* (that covers H12), respectively. In comparison, when probing the underlying data structures of the datasets obtained from the “Rate Team” surveying approach, the same three hypotheses exhibit only one common dimensionality, and thus they are categorised as one factor, termed as *effectual opportunism.*

Effectual processes can assist entrepreneurial and innovative individuals to identify and capture opportunities to gather new means or improve one’s goal (Fisher, 2012; Sarasvathy, 2001; Sarasvathy et al., 2014). Aspirant entrepreneurs and innovators of the teams can rise above constraints and offer valuable solutions that solve complex and bewildering challenges if strategic thinking is applied effectively (Prahalad & Hamel, 1994; Zahra & Nambisan, 2012). Leaders’ abilities to intertwine their entrepreneurial flares with strategic cognition influence how their organisations can identify, create and capture value to outcompete their rivals or harness a new market (Kim & Mauborgne, 2019; Schoemaker, Heaton & Teece, 2018).

By embracing an abduction logic, innovators and entrepreneurs can navigate and prevail in times of uncertainty and adapt effectually (Archer et al., 2009; Dorst, 2011; Dunne & Dougherty, 2016; Fisher, 2012; Mintzberg, 1994; Sarasvathy, 2001, 2004). These individuals develop new goals while diligently searching for new means to advance their positions in the value creation process (Sarasvathy, 2001). In order to ensure this goals-means abductive reasoning method can lead to fruitful outcomes (Archer et al., 2009), individuals will be required to formulate various smart assumptions and leverage opportunities as they progress along the ALP journey. The concept of *effectual reasoning* approach directly contradicts the notion of "intent focused" as proposed by Liedtka (1999) to some degree. Considering that Liedtka (1999) stated: "Strategic intent provides the focus that allows individuals within an organization to marshal and leverage their energy, to focus attention, to resist distraction, and to concentrate for as long as it takes to achieve a goal. In the disorienting swirl of change, such psychic energy may well be the most scarce resource an organization has, and only those who utilize it most efficiently will succeed." Whereas *Hypothesis-driven opportunism* and *effectual reasoning* factors uncovered from the "Rate Self" surveying approach or the *effectual opportunism* factor uncovered from the "Rate Team" approach embrace an emergent ethos during the problem-solving and decision-making processes.

This research suggests that the *CI* of the ALP team is not dependent on the "intent focused" cognitive-behaviours which cause them to be fixated with the initial goals and leave them to be less inclined to be adaptive. Instead, the *CI* of the ALP teams is more directly proportional to how teams make smart assumptions, hypothesise the causality leading to plausible outcomes and leveraging all opportunities encountered, similar to the "Birds-in-Hand" principle of the effectuation (Sarasvathy, 2001; 2004). Irrespective of surveying approaches, the research findings posit that it would be helpful to include *effectual reasoning* into the strategic thinking framework. The research also advocates that *intelligent opportunism* and *hypothesis-driven*, two principles of strategic thinking posited by Liedtka, can be merged as one principle.

5.5.5.2 Difference two

The second noticeable difference is around the underlying data structures of hypotheses H18: positive transfer, H19: constructive conflicts and H20: idea inclusivity. Once again, similar to the first noticeable difference, the datasets of the "Rate Self" surveying approach reveal that hypotheses H18, H19 and H20 possess two underlying structures. These two factors are termed *positive engagement* (that covers H18 and H19) and *idea inclusivity* (that covers H20). In comparison, when probing the underlying data structure of the datasets obtained from the "Rate Team" surveying approach, the same three hypotheses exhibit only one common dimensionality and they were thus categorised as one factor, termed as *positive community.*

The process to establish rewarding and viable entrepreneurship or innovation can be tremulous with countless unpredictable challenges. Researchers have posited the importance of positivity in team performance and innovativeness (Fulop et al., 2019; James & Wooten, 2010; Kozlowski & Ilgen, 2006; Y. Lee et al., 2018; Lehr, Ferreira & Banaji, 2019; Lei et al., 2013; Mathieu, Maynard, Rapp & Gilson, 2008; Mitchell et al., 2015; Pihlajamaa, 2017). As Chapter 2 (Section 2.5.19) have discussed that while many scholars posit that encouraging and managing conflicts can become favourable to innovation (Choi, Seo, Hyun & Bechtoldt, 2019; Costa et al., 2015; De Dreu et al., 2010; De Wit et al., 2012; Gebert, Boerner & Kearney, 2010; Hall et al., 2017; Hill et al., 2018; Humphrey, Aime, Cushenbery, Hill & Fairchild, 2017; Kakar, 2018; Kozlowski & Chao, 2018; Muthusamy, Wheeler & Simmons, 2005; Sinha et al., 2016; Staggers, Garcia & Nagelhout, 2008), several other researchers contest against such recommendations and posit that the relationship between conflict and innovation is not a trivial one (Hülsheger et al., 2009; O'Neill et al., 2013; Xie et al., 2014). Similarly, while numerous studies suggested that the act of exercising idea inclusivity; through increasing open-mindedness, encouraging various forms of diversity and reducing conflict; will greatly benefit team innovativeness (Brimhall & Mor Barak, 2018; Costa et al., 2015; Earley & Mosakowski, 2000; Guo et al., 2017; Harvey, 2017; Hill et al., 2014; D. Lee, Huh & Reigeluth, 2015; Love & Roper, 2009; Meslec et al., 2016; Mitchell et al., 2015; Niebuhr, 2010; Paletz et al., 2017; Stahl, Mäkelä, Zander & Maznevski, 2010; Tadmor, Satterstrom, Jang & Polzer, 2012; Thayer et al., 2018; Woolley et al., 2010), a number of researchers cautioned against making hasty judgements in favour of such types of recommendations and have called for more investigations to be conducted (Bell et al., 2011; Garcia Martinez, Zouaghi & Garcia Marco, 2017; Harvey, 2013; Hofhuis et al., 2018; Horwitz & Horwitz, 2007; Hülsheger et al., 2009; Jackson & Joshi, 2011; Østergaard et al., 2011; Stahl, Maznevski, Voigt & Jonsen, 2010; Van Der Vegt & Bunderson, 2005; Wang, Cheng, Chen & Leung, 2019; Zhan, Bendapudi & Hong, 2015). The study made a meaningful contribution to these scholarly disputes. The findings of this study found that despite the small differences existing between the two models obtained from the two surveying approaches, the acts of *positive engagement* and *idea inclusivity,* or, *positive community*, hold a relatively higher influenceability on the *CI* of the team.

5.5.6 Comparing “Rate Self” and “Rate Team” surveying approaches

Table 5.1, documented in Section 5.5.2, ranks the path coefficients from the highest to the lowest for both surveying approaches, along with the explanatory power for each predictor. The findings suggest that the “Rate Team” surveying approach produced marginally better predictability than the “Rate Self” surveying approach for this particular study.

Socio-psychology studies have demonstrated that individuals’ judgments on their behaviours are different from how they judge others (Adams-Webber & Davidson, 1979). Various studies have highlighted that the presences of bias self-reporting surveying methods can threaten the validity of business research and hamper the development of organisational behaviour body of knowledge ((Auer & Griffiths, 2017; Cunningham & Turk, 2017; R. J. Fisher, 1993; Roberts, 1995; Rowland, 1990; Symons & Johnson, 1997). Self-judgement has been reported to be more situational, less consistent and accurate than when an individual judges the behaviours of others (Jones et al., 1971; Lay et al., 1974). Even though, *strictly per se*, the “Rate Team” surveying approach to a certain degree also relies on how individuals construe the situations based on their own perspectives, and by so doing, some degree of biases may be reduced when the raters evaluate their team members as a collectively. After all, *CI* is a construct that arises from the effort of the collectives.

This research found that the self-judgement research method (“Rate Self” surveying approach) produced findings that are slightly less superior than research methods that evaluate others (“Rate Team” surveying approach). The observations somewhat suggest that team members may have a more unobstructed view about each other’s performance and capability than the team members’ own perceptions about themselves (Vazire & Carlson, 2011), even though this phenomenon is not as clear cut as some literature suggested. The path coefficients and the coefficient of determinations to the latent variables (i.e. the three cognitive-behavioural clusters) showed that the "Rate Team" surveying approach exhibits a higher predictability of *CI* when compared against the outcomes of the "Rate Self" surveying approach. The findings also support the presence of self-judgement biases as advocated by the scholars mentioned in the previous paragraph.

However, after artificially compartmentalising the ranking the *CI* influenceability of the factors for both models into top, middle and bottom segments (even though the Figure 5.2 denotes only "higher" and "lower" *CI* influenceability), it is evident that the ranking between the two models are comparable (refer to Figure 5.2). Nevertheless, seeing that the topics of self-judgement vs judgement of others remain fascinating to scholars (Cunningham & Turk, 2017), further validations concerning the subtle but noticeable differences between the models generated from the two surveying approaches may be required. Moreover, this paper calls for future research to investigate the outcome in an instance where the survey participants would be requested to rank their own and their teams' cognitive-behaviours interpedently, instead of independently as prescribed by the design of this research.

5.6 Chapter conclusion

This chapter discusses the key research findings. It attributes illusory superiority and negative bias as the plausible reason that this research witnesses the disparity between "Rate Self" and

“Rate Team” surveying approaches as well as the skewness of the datasets. Various hypotheses were merged and categorised into different factors owing to the similarity of the underlying data dimensionality. The factor analyses uncovered two preliminary models consisting of 12 and 10 factors. After being subjected to PLS-SEM calculations, both preliminary models rejected factors that covered the original Hypothesis 7 and accepted all other 19 hypotheses. Despite the final path models showing a slight degree of differences, the models were deemed acceptable after examining the goodness-of-fit measurements. Lastly, the ranking of predictability and explanatory power of the outer and inner constructs for both models show slight degrees of differences. The “Rate Team” surveying approach was found to be marginally better than “Rate Self” surveying approach in terms of measuring the *CI* of the ALP teams.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter will draw on the interpretations from the previous chapter and deliberate the concluding remarks in response to the research statements and the hypotheses of this study. In addition, the contributions towards the advancement of *CI* academic theory and business applications are drawn. A brief discussion of the significance of these contributions is also presented. Finally, the chapter will articulate the practical recommendations, limitations and suggestions for future empirical research.

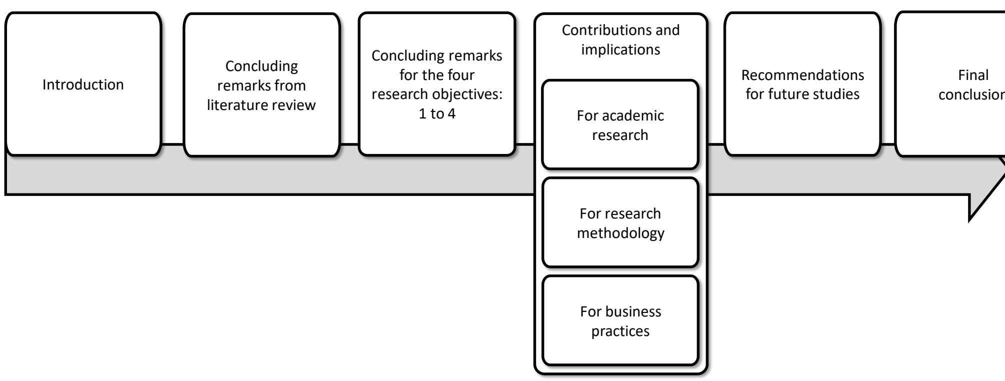

Figure 6.1 The flow and the key components of Chapter 6 (author's own)

6.2 Concluding remarks from the literature review

Firstly, this study categorised *CI* body of knowledge into three interrelated themes as discussed in Sections 2.2.1, 2.2.2 and 2.2.3; the grand challenges, organisational modus operandi and small teams. Based on the evidence uncovered, the literature review was able to argue that enhancing our comprehension on how to harness and strengthen *CI* effectively within the small team context would meaningfully contribute towards our understanding on *CI* building within the context of grand challenges and organisational modus. The literature review was also able to highlight various gaps that persist within the research theme of *CI* in small teams (Refer to Sections 2.2.3, 2.3.1, 2.3.2 and 2.3.3).

The literature review chapter further highlighted the disconnect between the widely-adopted IQ tests and the actual performance of adults as study assert that our contemporary understanding of what makes an adult intelligent need a great deal of improvement. The correlations between the scores generated from these IQ tests and adult intelligence are insignificant (Ackerman, 2017; Von Stumm, 2014). Scholars have deliberated that this disconnect is primarily owing to the fact that tests as such do not take cognisance of adults' cognitive-behaviours that are highly relevant to how they solve real-life activities outside of the laboratory setting (Ackerman, 2017; Habeck et al., 2019; Laborda et al., 2019; López-Robles et al., 2019). Therefore, extending this observation regarding the relationship between cognitive-behaviours and adult intelligence, the chapter asserted that one of the effective ways to investigate *CI* of the small team is to empirically assess the causality between the outcome of the ALP competitions and how each individual ALP team member and their teams a collective exhibit various cognitive-behaviours.

After having examined and incorporated various scholars' definitions and explanations of *CI* in an attempt to synthesise a working definition for this study, the literature review has conclusively identified three types of cognitive-behaviours that are typically covered in different scholars' definitions and explanations of *CI*. However, the extensive literature review also demonstrated that a majority of studies to date does not integrate these three cognitive-behaviours in the investigation of *CI*. For example, after Table 2.1 had analysed the definitions and explanations offered by the various researchers, it demonstrated that apart from one article which vaguely incorporated all three cognitive-behaviours, other 40 articles do not integrate all three cognitive-behaviours into the central theoretical underpinning of their *CI* tenet. A *CI* predictive framework for small teams that has taken all of these three cognitive-behaviours into account is well-needed but has not yet been established (Paletz & Schunn, 2010; Suran et al., 2020; Yu et al., 2018). It is with this logic that the following working definition for this study was constructed, "*CI* is the outcome of a combination of various synergistic cognitive–behaviours exhibited by collaborators that enable their teams to solve diverse challenges contextually and achieve common objectives effectively". However, the literature review chapter acknowledges that the quality of this working definition could only be ascertained after a series of thorough statistical analyses have been conducted against the research objectives of this study.

6.3 Concluding remarks for the four research objectives

Four research objectives were listed as the purpose of this study, and they can be found in Section 1.5. The following subsections shall assert the concluding remarks for each of them based on the discussions presented in Chapter 5.

6.3.1 For objective 1

The first objective of this study is to measure, evaluate and determine the extent of influence of the selected constructs within three cognitive-behavioural clusters on the *CI* of small teams. This study has achieved this objective.

This study investigated the extent of the impact that the 20 selected hypotheses have on the outcomes of the ALP competitions of various ALP teams in different CEE programmes of a business school in South Africa. (As stated in Chapter 2, these hypotheses are H1: management input, H2: intra-organisational connection, H3: external perspectives, H4: customers involvement, H5: expansive ecosystem, H6: integrative combination, H7: intent focused, H8: a systems perspective, H9: thinking-in-time, H10: intelligent opportunism, H11: hypothesis-driven, H12: effectual reasoning, H13: challenge biases, H14: credulous reflectivity. H15: shared leadership, H16: informal accountability, H17: disciplined delivery, H18: positive transfer, H19: constructive conflicts, and H20: idea inclusivity.) Considering that ALP competitions commonly require delegates to work together in teams to derive innovative or effective solutions to address specific business challenges of relevance to their companies (Anderson & van Wijk, 2010; (Conine Jr & Peratoner, 2019; Robertson & Bell, 2017), they do serve as an practical way to investigate the causality between the outcome of the competitions and the cognitive-behaviours of the team members. The winning teams of the ALP competitions can be deemed as the teams with higher *CI*. This study gathered the inputs from a total of 406 delegates from 12 programmes. Each delegate was requested to rate their perceptions of their own cognitive-behaviours and the general cognitive-behaviours of their respective teams. The findings demonstrated that apart from hypothesis 7: Intent focus, 19 out of the 20 hypotheses had a direct contributing effect on building *CI* in small teams. Therefore, their respective null hypothesis is accepted. The outcome of the statistical calculations further revealed that all three cognitive-behavioural clusters played a positive effect on the *CI* level of the ALP teams in a synergistic way. The findings of this study have updated our understanding of the relationship between *CI* and all of these hypotheses.

6.3.2 For objective 2

The second objective of this study is to measure, evaluate and determine which surveying approach, participants rating themselves or rating their team member as a collective, would lead to a more superior result for the study of *CI*. This study can conclude that the two rating approaches have generated two slightly different dimensionalities after their respective dataset was subjected to the factor analyses, and they yielded two different structural path models. However, after having carefully examined these two sets of factors extracted, as discussed in Section 5.5.2, the differences between the factors generated are not drastic. The high similarity between the two structural path models is accentuated in Figure 5.1. The most noticeable difference is that for “Rate Self” surveying approach, participants regard TMX cognitive-behavioural clusters, in other words, team dynamics, as the key attributor that would influence the *CI* of the team more than the other two cognitive-behavioural clusters. Whereas for the “Rate Team” surveying approach, the research participants deemed that all three cognitive-behavioural clusters play almost equal importance.

In general, the findings can conclude that the “Rate Team” surveying approach would produce statistical results that are marginally better than the “Rate Self” surveying approach in terms of the prediction of causal effect (β) and explanatory power (R^2). This study recommends that when it comes to *CI* related investigations, it would be slightly more effective to assess the individuals’ perceptions of the collective cognitive-behaviours of the team rather than assessing the individuals’ perceptions of their own respective cognitive-behaviours. While the advantage of surveying the collective cognitive-behaviours over the individual cognitive-behaviours is marginal, the end messages are profoundly different.

6.3.3 For objective 3

Initially, this study's third objective is to construct a novel integrative cognitive-behavioural framework for the prediction of *CI* of small teams. However, based on the statistical calculations performed on the datasets harvested from the "Rate Self" and "Rate Team" surveying approaches, two different integrative cognitive-behavioural frameworks for the prediction of *CI* of small teams were observed.

As previously stated, these two frameworks share a high resemblance. The top 10 hypotheses with the most impact to *CI* are the factors that were extracted from condensing hypotheses H5, H6, H8, H9, H10, H11, H12, H18, H19 and H20. In other words, exercising effectual and hypothesis-driven type of opportunity-leveraging mindsets would empower the small teams to advance their *CI* marginally better than other cognitive-behaviours. The team members' ability to think in a systemic way, including the temporal factors, is deemed to be highly relevant in the context of fostering *CI*. The findings further reveal that when team members transfer positivity to each other and build a community with idea inclusivity in mind, these cognitive-behaviours will have a slightly higher gratifying impact on the teams' ALP competitions than other TMX cognitive-behaviours. Lastly, the *CI* of the ALP teams is also influenced by the team members' ability to exercise boundary-spanning in ways that permit the teams to expand the reach for acquiring and utilising the necessary resources when needed.

However, despite their similarities, for the framework generated from the “Rate Self” survey approach, the overall emphasis is on TMX cognitive-behavioural clusters when the teams attempt to boost their *CI*. In contrast, for the “Rate Team” surveying approach, the framework advocates the importance of exercising all three cognitive-behavioural clusters. As the “Rate Team”–based framework is marginally more significant than the “Rate Self”–based framework, this study would like to conclude that while having the capability of thinking strategically is an essential component to harness *CI* in small teams, the team members need the resource to think effectively together. At the same time, they also need helpful exchange among the team members to think, as well as to gather and utilise resources successfully. Missing any of the three cognitive-behavioural facets would reduce the level of *CI* in small teams.

6.3.4 For objective 4

Finally, the study aimed to offer an empirically-based verdict to deliberate whether *CI* is indeed a valid construct or not. In recent years, *CI* research communities have been advocating the need for the research communities to invest more effort into understanding this important topic within the context of team science (Aggarwal & Woolley, 2018; Choudhury & Haas, 2018; Credé & Howardson, 2017; Grimon et al., 2017; Kaur & Shah, 2018; Woolley & Fuchs, 2011; Yu et al., 2018). Despite the causal effects of these 19 cognitive-behaviours on the outcome of the ALP competitions being marginal, the statistical calculations are able to demonstrate their notable relationship and hence infer that *CI* is a valid construct. The findings assert that to foster *CI* in small teams is not solely about how individuals think as a group. Nor it is merely about how team members collect resources and interact with each other. It is about all three cognitive-behaviours, and this concluding remark is well-aligned with the similar postulates proposed by scholars who advocate that the study of adult intelligence must fundamentally change (Ackerman, 2017; Habeck et al., 2019; Laborda et al., 2019; López-Robles et al., 2019; Von Stumm, 2014).

6.4 Contributions and implications

6.4.1 For academic research

The first contribution of this study is that the outcome of the empirical investigation demonstrates the existence of *CI*. Considering that researchers are disputing the rationality of this construct (Bates & Gupta 2017; Credé & Howardson, 2017; Kaur & Shah, 2018; Woolley et al. 2010; 2015), this study has demonstrated that the winning ALP teams have exercised three clusters of cognitive-behaviours slightly better than the teams who did not win the ALP competitions. This integration of the three clusters of cognitive-behaviours was in response to the call for an integrative framework that can serve as *CI* predictor (Paletz & Schunn, 2010; Suran et al., 2020; Yu et al., 2018). The implication of these findings infers that scholar should consider new ways of assessing *CI* because by merely examining one type of cognitive-behavioural factors may not provide a holistic view.

The relationship between the proposed twenty hypotheses and *CI* has not been extensively examined. Based on Chapter 2, conflicting views concerning how some of these hypotheses impact team innovativeness continue to persist. Moreover, empirical studies that examine the effects of combining boundary-crossing, resourcefulness, strategic thinking, effectual thought-processing, and social dynamics within the teams against the subjective measure(s) of *CI* remain practically non-existent. For example, hypotheses H16 (informal accountability) and H17 (disciplined delivery) are two of the constructs that scholars have not underscored the importance of, nor of their relationship with entrepreneurship and innovation. A low ranking of hypothesis H15 (shared leadership) contests the need for shared leadership for high-performing innovative teams. The ability of the ALP teams to acquire and utilise resources effectively is deemed more important than whom the teams have acquired the knowledge from.

In addition, Liedtka's strategic thinking framework has not been empirically although the five elements have been widely accepted to enhance the thinking capability of individuals (Liedtka, 1998). This research represents the first empirical validation on Liedtka's strategic thinking framework. While four of the principles, *viz*, systems perspective, intellectual opportunism, thinking-in-time and hypothesis-driven appeared to be valid, the element on intent focussed should be revised. The findings further revealed that other thinking styles, such as effectual reasoning, challenge biases and credulous reflexivity, should be incorporated as essential strategic thinking principles. The implication is that more modern strategic thinking frameworks should respond to today's challenges. Investigations that can effectively update our understanding on this highly important construct should be encouraged.

Considering that the results demonstrate a marginal but acceptable causality between cognitive–behaviours and the outcome of the ALP competitions. Therefore, this study recommends scholars to adopt the following definition for CI or a variation of it, *"CI is the outcome of an effective combination of synergistic cognitive–behaviours exhibited by collaborators that enable their teams to solve diverse challenges contextually and achieve common objectives effectively."*

Lastly, the rapid growth of CEE programmes has been seen over the past five decades (Lynne Bevelander, 2012). However, with the advent of new technology and social behaviours, the learning and development body of knowledge must also be kept up to date, particularly from the perspective of harnessing *CI* to increase the impact of the training initiatives (Pedler & Burgoyne, 2017; Grimón, Monguet, Meza, 2015; Ekwunife-Orakwue; Tian-Lih, 2014). The findings of this study would serve as the foundation towards developing a range of new principles for future training initiatives and open up for a wide array of exciting research topics for the scholarly communities.

6.4.2 For research methodology

The quest for gaining a better understanding of the *CI* of relevant management science continues to fascinate researchers across many sub-disciplines, but many of them do not emulate business settings. The research methodologies of investigating *CI* vary drastically from the purely theoretic and conceptual (Kaur & Shah 2018; Luo et al. 2009; Surowiecki, 2005; Szuba 1998; 2002; Tapscott & Williams, 2006) to simulations and experiments within non-business related settings (Bosse et al. 2006; Kim et al., 2017; Pérez et al., 2016; Mao & Woolley, 2016; Woolley et al. 2010; 2015). These *CI* studies are not conducted in settings closely resembling the real-life organisational context. The design of this study is based on validating perceptions against actual experimental outcomes. It thus provided more substantial credibility. The research findings suggested the importance of deriving new research designs that closely resemble the business context when studying *CI*.

The observations from the findings suggest that team members may have more unobstructed view of each other's performance and capability than the team members' own perceptions about themselves (Vazire & Carlson, 2011). These findings are not entirely a surprise seeing that it is uncommon to come across studies that advocate an individual's tendency to rank their groups higher than how they rank themselves (Jourden & Heath, 1996). Superiority biases can be the possible psychological phenomena which account for this observation. Superiority bias the human cognitive-behaviours that affect individuals to rate themselves more favourably (Hornsey, 2003; Kruger, 1999) and results in individuals overestimating their own capabilities (Brown, 1986; Dunning et al., 2003). Research to date has not conclusively elaborated whether data obtained from the two different surveying approaches adopted by this study may significantly affect the development of the theory of *CI*. Despite that the differences in terms of the pattern matrices, path coefficients and other relevant values between the two models generated are subtle, the findings suggest that one should carefully consider one's surveying approach when attempting to investigate the antecedents and consequences of team science related research. Many findings of this study suggest that the "Rate Team" surveying approach is a slightly more suited method for such kinds of research topics.

6.4.3 For business practices

Owing to the unrelenting pressure from the ever-increasing competitive business environment, modern day firms are compelled to enhance its corporate entrepreneurship and innovation performance (Boder, 2006; Croce et al., 2016; Gregg, 2009; Mao & Woolley, 2016; Nguyen et al., 2019; Kaur & Shah, 2018; Kolonin et al., 2016; Zopiatis & Theocharous, 2018). The findings of this study could be further developed into a *CI* scale which would benefit firms to reskill or upskill their teams that are involved in solving strategic issues. Moreover, human resource practitioners and leaders can utilise some elements of this research to assist their organisations in assembling the right members for teams that may be specifically set up to drive corporate entrepreneurship and innovation related projects (Mayo & Woolley, 2017); Lesser et al., 2012 Lesser et al., 2012).

Increasing organisational agility has been cemented as one of the management philosophy of today's competitive landscape (Denning, 2016; Fayezi, et al., 2017, Teece et al., 2016). One plausible way to enhance organisational agility is through the establishment of temporary teams (Ebrahim, Krishnakanthan & Thaker, 2018). Since these teams may evolve over time, either progressively weakening or gaining strength, depending on the state of the current relationships and the existence of identifiable mutual benefits within the teams (Burgelman, 1991), the understanding of antecedents for *CI* for small teams becomes even more critical.

The findings of this research can provide practitioners who are in charge of the CEE programmes with new inspirations on how to complement the existing contents of relevant training modules, such as the ones that focus on developing high-performance, innovative teams (Kim et al., 2017). The custodians of the ALP process can also leverage the findings of this research to guide their ALP teams and modify the existing ALP process.

This study demonstrates that for organisations to build effective and innovative teams, leaders cannot merely focus on promoting the imaginative, creative and effectual types of endeavours and operating ethos. Advocating the ability for teams to take disciplined action and carry out self-reflection are equally important. Instead of focussing on promoting shared leadership, which appears to be an attractive concept in our time (Martin et al., 2018), leaders should work diligently towards promoting the culture of *idea inclusivity*. When it comes to promoting corporate entrepreneurship and innovation, the author would like to advocate that doing the "boring things" is equally important as doing the seemingly "exciting things" – though it is a philosophy that is emphasised much less by practitioners.

Lastly, the disparities between the self-reporting of own behaviours and self-reporting of others have interesting implications to the firms. In order to prevent further disruptions, companies must transform how they help their employees to get the work done in agile and collaborative ways to increase the rate of innovation outputs. One of the effective ways to achieve the transformation is to re-engineer the outdated performance appraisal mechanisms (Kiron & Spindel, 2019). With some adjustments, the findings of this research can be incorporated into a modern performance management process to cultivate more of a collaborative and innovative way of working as teams.

6.5 Limitations

This study has several limitations that should be taken into consideration shall one decides to adopt or further develop this preliminary *CI* prediction model.

Firstly, it is crucial to understand that measuring the cognitive-behaviours of the team members in natural settings can be a tricky process owing to the potential interferences by a number of unwanted variables, such as levels of organisational politics and disparities in the team size. However, despite that using ALP process can the best alternative when assessing how these twenty cognitive-behavioural characteristics may affect the *CI* of the small team, the survey outcome cannot rule out the possibility that the data obtained may somewhat be affected by participants' emotions and biases. Other factors such as delegates' maturity levels, prior interpersonal dynamics between members before then enrolled for the programmes, and personal agendas could have also impacted the accuracy of the investigation.

Secondly, the scope of work for the ALP teams is more slanted towards ideation and preliminary prototyping. Other the unique challenges presented in other critical phases of innovation, such as implementation and growth, could require the team to exercise these cognitive-behaviours slightly differently. Hence, it is important to highlight that this *CI* predictive model may be more suited for ideation related challenges.

Thirdly, despite the first three hypotheses tested to what extent do the inputs of key stakeholders contributed to the overall strengths of the *CI*, this study does not examine how elements of luck might have affected the overall outcomes. It is difficult to assert that team members would not have stumbled across valuable ideas serendipitously through interacting with individuals with their network (Busch & Barkema, 2020).

Fourthly, considering that the style of CEE programmes implemented is generally, nurturing and supportive, it may have slightly influenced how participants score themselves and their teams. In addition, seeing that this study is conducted in South Africa, the findings of this study cannot guarantee that the national culture dimensions did not influence the perceptions of the research participants (Hofstede, 2011).

Lastly, while each ALP competition institute a panel of judges and these judges do keep other in check, this study cannot guarantee that all judges will evaluate the business concepts produced by the ALP teams without any inherent bias.

6.6 Recommendations for future studies

Despite that this research has been administered among different industry employees, samples have been collected from only one country. The researcher recommends that the same research to be implemented in different countries as an attempt to increase the thoroughness of the findings. Comparative studies could be carried out by validating cognitive-behavioural constructs and different surveying approaches against Hofstede's culture dimensions (Hofstede & Bond, 1984).

Future investigations to include a longitudinal assessment on the cognitive-behaviours of the team members. This additional data can provide further insights on which cognitive-behavioural factors must persist throughout the ALP journey in order for small teams to do well and which cognitive-behavioural factors could be exercised intermittently but still permit the teams to do well. Adopting a mixed research method may add substantial richness to such investigation.

This study is unable to draw any conclusion between the causality of adult intelligence and *CI*, in part owing to a disconnect between the scores obtained from the traditional “IQ” tests and innovative performance of the individuals (Ackerman, 2017). Future studies can modify the framework proposed by this study and investigate its suitability to test for adult intelligence. Thereafter, such study can further assess the types of relationship between adult intelligence exhibited by the individual team members and *CI* of the small teams. In addition, the study between *CI* of the small team and personality trait models, such as OCEAN (openness, conscientiousness, extraversion, agreeableness, and neuroticism) (Guy, Kim, Lin & Manocha, 2011), would be an intriguing and potentially gratifying research.

A series of in-depth quantitative studies can be carried out to allow one to pin-point the causes resulting in the discrepancies of the outcomes generated from the “Rate Self” and “Rate Team” surveying approaches. Complementary qualitative investigations could also be carried out to distil the subtle nuances resulting in these disparities.

This study calls for more scholars to formulate strategic thinking frameworks or principles that can respond to today's challenges. The need for agility is demanded by today's organisations in today's seeing that the business landscape is undergoing constant fierce disruption. More scholars could invest their effort to formulate a modern strategic thinking framework by adopting the relevant findings of this study. Furthermore, editors of selected top journals have been urging scholars to investigate these noteworthy topics: how to build resourcefulness within the context of entrepreneurship (Williams et al., 2019), how to establish the effective strategy and structure to manage in the times of uncertainty (Chintakananda, Singh & McIntyre, 2019) and what do future management theories look like (Roth, Sales, Perez & Kaivo-oja, 2019). One can evaluate whether selected *CI*–enhancing cognitive-behaviours can serve as the antecedents of these noteworthy topics.

South Africa is a nation that is indeed for the embodiment of entrepreneurship and innovation (Urban & Verachia, 2019). Considering that *CI* is a paradigm that is closely aligned with the African philosophy Ubuntu (Fink et al., 2005; (Mosia & Ngulube, 2005; Shumba, 2011), how ubuntu philosophy could be deployed in conjunction with *CI* principles to promote entrepreneurship and innovation have not been clearly understood, let alone articulated, in African businesses and society. It is potentially a significant research agenda during this era as South Africa is experiencing unprecedented challenges in growing its economy.

In the era of the Fourth Industrial Revolution, not only are organisations increasingly relying on crowdsourcing or peer-matching (Lesser et al., 2012; Leimeister, 2010; Lykourentzou et al., 2010; Luo, Xia, Yoshida & Wang, 2009) to advance their goals or solve grand challenges, (Landemore, 2012; Malone & Klein, 2007; Mann & Helbing, 2017), the involvement of advanced technologies such as artificial intelligence, internet of things and big data profoundly changes the fabric of the business landscape. Without understanding the key antecedents that can effectively enhance the *CI* of teams, groups or communities, these advanced technological platforms may not help leaders to create new values nor allowing them tap into others' contributions in a productive manner (Mulgan, 2018; Senyo et al., 2019). More empirical studies can be dedicated to the investigation of how *CI* will be affected in human-cyberphysical interactions, or singularity types of settings (McHugh et al., 2016; Mello & Rentsch, 2015; Mulgan, 2018a). The findings of this research can provide some general anchoring points for future research along with these directions.

6.7 Final conclusion

Innovations emerge as a result of human collaboration (Derex & Boyd, 2016). Seeing that entrepreneurial and innovative business endeavours can often be attributed to the joint efforts among individuals working as teams (Foss, 2018; Nisula & Kianto, 2016; Storey et al., 2016), the quest to identify key underlying cognitive-behavioural factors that would affect the *CI* among a team becomes highly relevant to the contemporary management science. However, even though the academic pursuit of unravelling the antecedents affecting *CI* continue to gain popularity, scholars are urging for more comprehensive management science research owing to the lack of consensus in various notable aspects, such as the antecedents (Credé & Howardson, 2017)Kaur & Shah, 2018; Smith, 2008; Paletz & Shunn; 2010). Moreover, frameworks that integrated *CI* enabling cognitive-behaviours within the corporate context remain scarce.

Quoting from a literature review on collective intelligence authored by Yu and co-authors (2018) which suggested that, "As for the study on the mechanism of collective intelligence, the existing research results affirm the positive role of group wisdom in guiding the practice of human society and have given the technical support and platform for the realization and optimization of group wisdom. But there is still a lot of room to explore." It remains imperative to further our knowledge on this topic. This sentiment is echoed by many scholars (Boder, 2006; Croce et al., 2016; Gregg, 2009; Mao & Woolley, 2016; Nguyen et al., 2019; Kaur & Shah, 2018; Kolonin et al., 2016; Zopiatis & Theocharous, 2018).

In summary, not only did this study satisfy its research objectives, it also generated various novel insights. But the most profound insight generated from this study is perhaps as follows – to build a strong *CI* effectively among teams in organisations; it is not just about "culture eats strategy for breakfast", it is more about acquiring and utilising the right resources, thinking strategically and effectually as well as having the right team dynamics and upholding the discipline.

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ANNEXURE A: SURVEYING PROCESS AND QUESTIONNAIRE

This section consists of three parts: 1) correlating hypotheses with question items, 2) surveying schedule, and 3) questionnaire

Part I: Correlating hypotheses with question items

The following table is not for distribution during the surveying process. Instead, it is for researcher's own use only. As the two question items that test one hypothesis, they are deliberately kept further apart so that the participants have to think about each question item carefully.

Table A.6.1 Correlations between hypotheses and question items

Resource acquisition and utilisation (RAU)	
Hypothesis 1 – Management input	Question items 1 & 21
Hypothesis 2 – Intra-organisational connection	Question items 2 & 22
Hypothesis 3 – External perspective	Question items 3 & 24
Hypothesis 4 – Customers' involvement	Question items 4 & 25
Hypothesis 5 – Expansive ecosystem	Question items 5 & 25
Hypothesis 6 – Purposeful integration	Question items 6 & 26
Strategic Thinking (ST)	
Hypothesis 7 – Intent focused	Question items 7 & 27
Hypothesis 8 – A systems perspective	Question items 8 & 28
Hypothesis 9 – Thinking-in-time	Question items 9 & 29
Hypothesis 10 – Intelligent opportunism	Question items 10 & 30
Hypothesis 11 – Hypothesis-driven	Question items 11 & 31
Hypothesis 12 – Effectual reasoning	Question items 12 & 32
Hypothesis 13 – Challenging biases	Question items 13 & 33
Hypothesis 14 – Credulous reflexivity	Question items 14 & 34
Team Members Exchange (TMX)	
Hypothesis 15 – Shared leadership	Question items 15 & 35
Hypothesis 16 – Informal accountability	Question items 16 & 36

Hypothesis 17 – Disciplined delivery	Question items 17 & 37
Hypothesis 18 – Positive transfer	Question items 18 & 38
Hypothesis 19 – Constructive conflicts	Question items 19 & 39
Hypothesis 20 – Idea inclusivity	Question items 20 & 40

Part II: Surveying schedule

2 min = Greet the delegates, explain the significance of this study and the voluntary nature of the surveying process

3 mins = Explain the questionnaire

15 mins = Administer the questionnaire and be on standby to address queries

Part III: Questionnaire

As suggested in my speech, using scale 1 to 7, this survey requests you reflect back on the whole ALP journey then rate the following categories against all question items:

(1) **YOU** = "how do you generally think/behave?" and

(2) **TEAM** = "how do your team members generally think/behave?"

Interpretations of the scale (1 to 7)

1	2	3	4	5	6	7
Strongly disagree / Very poorly	Disagree / Poorly	Somewhat disagree / Slightly less than average	Neutral / Average	Somewhat agree / Slightly above average	Agree / A reasonable amount	Strongly agree / A significant amount

No.	Question item	YOU	TEAM
1	<u>You</u> / <u>Your team members</u> made an effort **to obtained valuable inputs from senior management and/or executives.**		

2	You / Your team members made an effort **to connect with key employees from other unit(s) to gain valuable inputs.**		
3	You / Your team members made an effort **to obtain valuable information from key stakeholders from outside of the organisation**, such as business partners, suppliers and/or subject matter experts, excluding the customers.		
4	You / Your team members made an effort **to gain different customers' inputs.**		
5	You / Your team made an effort **to leverage existing social capital to connect to more people who can provide beneficial information.**		
6	You / Your team made an effort **to integrate all information acquired to benefit the ALP process.**		
7	You / Your team made an effort **to maintain the overarching intention of right from the initial phase of project without pivoting from it.**		
8	You / Your team made an effort **to ponder about various possible causal relations between the key elements or ideas that may affect the ALP.**		
9	You / Your team made an effort **to connect the past to the present to the future when attempting to solve the ALP challenge.**		
10	You / Your team made an effort **to piggyback off other existing endeavour(s) and/or trend(s) to benefit the progress of the ALP.**		
11	You / Your team made an effort **to hypothesise different ways to tackle the ALP more effectively.**		
12	You / Your team made an effort **to reshape the goal and/or the next step of the ALP contextually.**		
13	You / Your team made an effort **to confront own biases of relevance to the ALP.**		

14	You / Your team made an effort **to reflect about the status of the ALP in an openminded way.**		
15	You / Your team made an effort to allow **all team members to take terms to lead the team.**		
16	You / Your team made an effort **to hold yourself/themselves accountable based on the tasks assigned.**		
17	You / Your team made an effort **to keep on the timeline of delivery.**		
18	You / Your team made an effort **to uphold the positivity within the team.**		
19	You / Your team made an effort **to ensure the conflicts among the members are constructive.**		
20	You / Your team made an effort **to welcome all ideas.**		
21	You / Your team members made an effort **to get hold of valuable knowledge from senior management and/or executives.**		
22	You / Your team members made an effort **to gather helpful information from other units/teams inside the organisation.**		
23	You / Your team members made an effort **to acquire the perspectives of relevant external stakeholders**, such as business partners, suppliers and/or subject matter experts, excluding the customers.		
24	You / Your team made an effort **to ensure that there is an adequate understanding of customers' perspectives.**		
25	You / Your team made an effort **to apply snowballing effect to link up with individuals who can provide valuable knowledge.**		

26	You / Your team made an effort **to prioritise which knowledge to integrate so that the ALP process can be benefited.**		
27	You / Your team made an effort **to resist changing the high-level direction of project established by the team right from the beginning of the ALP journey.**		
28	You / Your team made an effort **to exercise systems thinking in order to consider the challenge(s) holistically.**		
29	You / Your team made an effort **to explore how certain future scenarios can be created by thinking about the gaps/opportunities in the present and the past.**		
30	You / Your team made an effort **to explore various plausible opportune ways to leverage other initiative(s) and/or individual(s) for the benefit of the ALP.**		
31	You / Your team made an effort **to ask questions that are along these lines: "what if… then what would happen", and/or "why not try this way, because…".**		
32	You / Your team made an effort **to adapt the way forward and/or to tackle the ALP based on the situation at hand.**		
33	You / Your team made an effort **to challenge the current logics that exist in the industry and/or within the organisation.**		
34	You / Your team made an effort **to honestly examine the reasons that transpire to the level/lack of progress made on the ALP.**		
35	You / Your team made an effort to **allow others in the team to take on the leadership role.**		
36	You / Your team made an effort **to uphold your/their responsibilities.**		
37	You / Your team made an effort **to ensure the progress are on track.**		

38	You / Your team made an effort **to transfer positivity among team members.**		
39	You / Your team made an effort **to channel the disagreements for the benefit of the ALP instead of becoming some level of interpersonal resentment.**		
40	You / Your team made an effort **to ensure individuals who generated the ideas felt acknowledged.**		

ANNEXURE B: ETHICS CLEARANCE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Chen

CLEARANCE CERTIFICATE **PROTOCOL NUMBER: H16/08/06**

PROJECT TITLE	Uncovering the antecedents affecting collective intelligence in strategic initiatives
INVESTIGATOR(S)	Dr J Chen
SCHOOL/DEPARTMENT	GIBS/
DATE CONSIDERED	19 August 2016
DECISION OF THE COMMITTEE	Approved
EXPIRY DATE	02 October 2019

DATE 03 October 2016 **CHAIRPERSON** J. Knight
(Professor J Knight)

cc: Supervisor : Professor B Urban

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

Signature ____________ Date ____/____/____

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

ANNEXURE C: SUPPLEMENTARY EFA STATISTICAL FINDINGS

Table C.1 EFA total variance explained of RAU cluster from "Rate Self" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.565	46.375	46.375	5.565	46.375	46.375	3.048	25.400	25.400
2	1.867	15.561	61.936	1.867	15.561	61.936	2.900	24.164	49.564
3	1.127	9.388	71.323	1.127	9.388	71.323	2.611	21.759	71.323
4	0.614	5.121	76.444						
5	0.588	4.897	81.341						
6	0.520	4.336	85.677						
7	0.473	3.940	89.618						
8	0.349	2.911	92.529						
9	0.338	2.814	95.343						
10	0.223	1.859	97.202						
11	0.171	1.421	98.624						
12	0.165	1.376	100.000						

Table C.2 EFA results of RAU cluster from "Rate Self" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	CRI
H1	I1a-RS			0.839	0.859
	I1b-RS			0.812	
H2	I2a-RS			0.692	
	I2b-RS			0.761	
H3	I3a-RS	0.800			0.891
	I3b-RS	0.824			
H4	I4a-RS	0.815			
	I4b-RS	0.838			
H5	I5a-RS		0.783		0.871
	I5b-RS		0.797		
H6	I6a-RS		0.818		
	I6a-RS		0.772		

Table C.3 EFA total variance explained of ST cluster from "Rate Self" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.370	35.391	35.391	6.370	35.391	35.391	3.900	21.665	21.665
2	2.051	11.397	46.788	2.051	11.397	46.788	3.014	16.747	38.412
3	1.959	10.883	57.671	1.959	10.883	57.671	2.871	15.949	54.360
4	1.504	8.356	66.028	1.504	8.356	66.028	1.778	9.878	64.238
5	1.380	7.665	73.693	1.380	7.665	73.693	1.702	9.455	73.693
6	0.855	4.750	78.442						
7	0.577	3.207	81.650						
8	0.479	2.660	84.309						
9	0.442	2.457	86.767						
10	0.392	2.179	88.945						
11	0.360	2.000	90.945						
12	0.292	1.624	92.569						
13	0.271	1.504	94.074						
14	0.249	1.384	95.458						
15	0.230	1.280	96.738						
16	0.218	1.214	97.951						

Table C.4 EFA results of ST cluster from "Rate Self" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	CRI
H7	I7a-RS	0.794					0.770
	I7b-RS	0.789					
H8	I8a-RS		0.784				0.898
	I8b-RS		0.824				
H9	I9a-RS		0.847				
	I9b-RS		0.858				
H10	I10a-RS	0.802					0.873
	I10b-RS	0.769					
H11	I11a-RS	0.827					
	I11b-RS	0.782					
H12	I12a-RS					0.876	0.1
	I12b-RS					0.880	
H13	I13a-RS			0.850			0.884
	I13b-RS			0.858			
H14	I14a-RS			0.770			
	I14b-RS			0.757			

Table C.5 EFA total variance explained of TMX cluster from "Rate Self" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.021	41.844	41.844	5.021	41.844	41.844	2.721	22.678	22.678
2	1.485	12.372	54.216	1.485	12.372	54.216	2.616	21.800	44.478
3	1.263	10.522	64.739	1.263	10.522	64.739	1.794	14.952	59.430
4	1.153	9.604	74.343	1.153	9.604	74.343	1.790	14.913	74.343
5	0.714	5.951	80.294						
6	0.589	4.911	85.205						
7	0.504	4.198	89.403						
8	0.337	2.808	92.211						
9	0.283	2.355	94.566						
10	0.237	1.972	96.538						
11	0.218	1.817	98.355						
12	0.197	1.645	100.000						

Table C.6 EFA results of TMX cluster from "Rate Self" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	Factor 4	CRI
H15	I15a-RS			0.824		0.795
	I15b-RS			0.801		
H16	I16a-RS	0.812				0.858
	I16b-RS	0.824				
H17	I17a-RS	0.760				
	I17b-RS	0.704				
H18	I18a-RS		0.806			0.842
	I18b-RS		0.791			
H19	I19a-RS		0.709			
	I19b-RS		0.713			
H20	I20a-RS				0.881	0.859
	I20b-Rs				0.855	

Table C.7 EFA total variance explained of RAU cluster from "Rate Team" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.508	29.234	29.234	3.508	29.234	29.234	2.948	24.566	24.566
2	2.532	21.103	50.336	2.532	21.103	50.336	2.694	22.451	47.017
3	1.973	16.444	66.781	1.973	16.444	66.781	2.372	19.764	66.781
4	0.660	5.500	72.281						
5	0.593	4.940	77.221						
6	0.535	4.460	81.681						
7	0.526	4.385	86.066						
8	0.435	3.622	89.688						
9	0.408	3.398	93.086						
10	0.337	2.807	95.893						
11	0.264	2.201	98.094						
12	0.229	1.906	100.000						

Table C.8 EFA results of RAU cluster from "Rate Team" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	CRI
H1	I1a-RT			0.759	0.826
	I1b-RT			0.738	
H2	I2a-RT			0.799	
	I2b-RT			0.746	
H3	I3a-RT		0.828		0.832
	I3b-RT		0.835		
H4	I4a-RT		0.796		
	I4b-RT		0.788		
H5	I5a-RT	0.871			0.808
	I5b-RT	0.856			
H6	I6a-RT	0.856			
	I6a-RT	0.819			

Table C.9 EFA total variance explained of ST cluster from "Rate Team" surveying approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.888	36.798	36.798	5.888	36.798	36.798	3.635	22.722	22.722
2	2.047	12.791	49.590	2.047	12.791	49.590	2.957	18.479	41.201
3	1.804	11.276	60.866	1.804	11.276	60.866	2.897	18.107	59.308
4	1.554	9.713	70.579	1.554	9.713	70.579	1.803	11.271	70.579
5	0.831	5.194	75.773						
6	0.657	4.105	79.878						
7	0.563	3.520	83.398						
8	0.423	2.642	86.040						
9	0.377	2.359	88.399						
10	0.318	1.990	90.389						
11	0.307	1.918	92.307						
12	0.281	1.758	94.065						
13	0.274	1.712	95.777						
14	0.247	1.545	97.323						
15	0.220	1.376	98.698						
16	0.208	1.302	100.000						

Table C.10 EFA results of ST cluster from "Rate Team" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	Factor 4	CRI
H7	I7a-RT				0.838	0.823
	I7b-RT				0.833	
H8	I8a-RT		0.835			0.886
	I8b-RT		0.779			
H9	I9a-RT		0.821			
	I9b-RT		0.816			
H10	I10a-RT	0.718				0.881
	I10b-RT	0.708				
H11	I11a-RT	0.795				
	I11b-RT	0.773				
H12	I12a-RT	0.741				
	I12b-RT	0.727				
H13	I13a-RT			0.867		0.891
	I13b-RT			0.820		
H14	I14a-RT			0.814		
	I14b-RT			0.776		

Table C.11 EFA total variance explained of TMX cluster from "Rate Team" approach

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.680	39.002	39.002	4.680	39.002	39.002	3.700	30.831	30.831
2	2.133	17.776	56.778	2.133	17.776	56.778	2.717	22.644	53.475
3	1.482	12.352	69.130	1.482	12.352	69.130	1.879	15.655	69.130
4	0.755	6.290	75.420						
5	0.724	6.037	81.456						
6	0.482	4.013	85.469						
7	0.390	3.252	88.721						
8	0.340	2.830	91.551						
9	0.323	2.694	94.245						
10	0.299	2.495	96.740						
11	0.241	2.004	98.745						
12	0.151	1.255	100.000						

Table C.12. EFA results of TMX cluster from "Rate Team" surveying approach

Hypothesis	Item	Factor 1	Factor 2	Factor 3	CRI
H15	I15a-RT			0.801	0.788
	I15b-RT			0.812	
H16	I16a-RT		0.809		0.877
	I16b-RT		0.820		
H17	I17a-RT		0.790		
	I17b-RT		0.783		
H18	I18a-RT	0.779			0.899
	I18b-RT	0.772			
H19	I19a-RT	0.809			
	I19b-RT	0.802			
H20	I20a-RT	0.766			
	I20b-RT	0.712			