



**LUND UNIVERSITY**  
School of Economics and Management

# Strategic Thinking: Theory & Practice

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## **Abstract**

### **Purpose:**

The purpose of this study is to test a potential means of measuring strategic thinking ability (Cognitive Process Profiling) in individuals through a multi-method approach. First, we identify what strategic thinking is in theory by analysing the current literature and then identify the most prominent competencies that enable individuals to think strategically. Following this literature review, we have used Cognitive Process Profiling (CPP) in practice to determine if we are able to measure and isolate this ability. Finally, we seek to establish whether a correlation exists between the strategic thinking abilities of individuals and their work experience and educational background. Our findings may prove valuable to any organisation who intend to hire, or are looking to develop their employees, as well as for individuals who wish to assess their own strategic thinking capability.

### **Research Questions:**

Q:1 What is Strategic thinking?

Q:2 Does CPP measure the strategic thinking ability of an individual? Can we isolate this ability through the use of CPP and implementing our knowledge of the core competencies of strategic thinking?

Q:3 Does work experience and educational background have any influence on the ability to think strategically?

### **Methodology:**

Our research is based on a deductive approach. Findings were generated through the compilation of research on what concepts are indicative of strategic thinking, and then through drawing correlations between data which was generated via the CPP assessment, background questionnaires and in-depth interviews. The research design is in the form of a multi-method quantitative study since the data was gathered through multiple quantitative means. Structured interviews and questionnaires were analysed according to a scale to allow objective comparison with the CPP assessment itself.

### **Findings:**

Strategic thinking research is characterised by a multidisciplinary, multidimensional approach that we validated into 15 distinctive core concepts. We argue that strategic thinking is based upon an underlying process influenced by personality, value systems and environmental factors in any individual. Following this, we measured strategic thinking ability of individuals via CPP assessment and our own developed self-assessment tools (background and in-depth questionnaire). The results demonstrated that the CPP assessment do measures and isolates key cognitive elements of strategic thinking ability in individuals, however, in a more profound way for individuals from a managerial or executive background than students. This led us to consider the merit of an organisational context in our measurement process, whilst

maintaining an objective outlook due to the limited number of managers/executives involved in our study. Additionally, this study has cast doubt on the importance of work experience and educational background (engineering/non-engineering), as we did not find any conclusive evidence of their link with the strategic thinking.

### **Limitations:**

This study was conducted under stringent time limitations meaning we had to be specific not only with the number of participants (40 in its present format), but also the scope of the research. Ideally our research would have involved a higher number of participants to allow for further analysis and to consider CPP results across additional variances (e.g. specific years of experience, specific degree subjects or specific professions compared and contrasted with one another). In addition, since we also used self-assessment methods (survey and interview), we were reliant on each participant's ability to assess themselves, which at times may be subjective and variable. Lastly, once the CPP assessment is taken by an individual, they are not allowed to take it again.

### **Practical Implications:**

This study sheds light on what strategic thinking is and what the core concepts of strategic thinking are through analysis of the current literature. Our research has identified potential areas of expansion for measuring and isolating strategic thinking ability in individuals, and through experimentation, has identified areas that may not contribute to this understanding. Our research provides value to organisations who want to hire, or are looking to develop their employees, as well for those who wish to develop their understanding of strategic thinking, and individuals who wish to assess their own strategic thinking ability.

**Keywords: Cognition, Cognitive Process Profiling, Game Theory, Strategic Decision Making, Strategic Planning, Strategic Thinking, Work Environment**

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# Table of Contents

<b>Abstract</b>	<b>1</b>
<b>Acknowledgements</b>	<b>3</b>
<b>1. Introduction</b>	<b>7</b>
1.1 Background	7
1.2 Problem Discussion	8
1.3 Purpose & Research Questions	8
1.4 Research Limitations	9
1.5 What is CPP: A Brief Introduction	9
1.6 About our Study	9
Figure 1: A Summarized Study Approach	10
<b>2. Methodology</b>	<b>11</b>
2.1 Overview of our Methodology	12
2.2 Research Philosophy	15
2.3 Research Approach	15
2.4 Research Design	16
2.5 Time Horizon	16
2.6 Data Collection Method	16
2.6.1 Sampling Method	16
2.6.2 Data Collection from a Multi-method Quantitative Approach	17
2.7 Data Analysis	20
2.7.1 The CPP Assessment	20
2.7.2 Background Questionnaire & In-Depth Interviews	21
2.8 Data Quality	21
2.8.1 The CPP Assessment	21
2.8.2 Background Questionnaire & In-Depth Interviews	22
2.9 Limitations	22
<b>3. Theoretical &amp; Literature Review</b>	<b>23</b>
3.1 Introduction: A Lack of Consensus	24
3.2 Schools of Thought	24
3.3 The Core Concepts of Strategic Thinking	28
3.4 A Model of Strategic Thinking	31

<b>4. Cognitive Process Profiling (CPP)</b>	<b>33</b>
4.1 What is Cognitive Process Profiling (CPP)	33
4.2 Background & Context: Why we are using the CPP Assessment in our Study	39
4.3 Format of the CPP Assessment	40
4.4 CPP Results and Reports	41
<b>5. Findings &amp; Analysis</b>	<b>43</b>
5.1 Participant Background Questionnaire:	43
5.2 CPP Assessment Analysis	45
5.3 In-Depth Interviews Analysis	46
5.4 Cross-Analysis of the Data	47
<b>6. Discussion</b>	<b>54</b>
6.1 Research Question 1.1	54
6.2 Research Question 1.2	55
6.3 Research Question 1.3	57
<b>7. Conclusion</b>	<b>59</b>
<b>References</b>	<b>61</b>
<b>Appendix</b>	<b>65</b>
Appendix A - Participant Background Questionnaire Template	65
Appendix B - In-Depth Interviews Questions and Answers	69
Appendix C - CPP	77
Appendix D -Participant Background Questionnaire graphs	90
Appendix E - Table for Cross-Analysis from Questionnaires, CPP assessments and Interviews	100

# 1. Introduction

## 1.1 Background

### *The Importance of Developing Strategic Thinking Ability and as a Consequence to Define and Measure it*

We are living in a world that is more dynamic, complex and interrelated than ever before, which has given rise to a global, unpredictable and turbulent environment. This has created a need for organizations to go and look back how they can remain sustainable and competitive in this cutthroat environment. To assist organizations, leading academic thinkers have examined Strategic Thinking as a concept and the merits of being a 'strategic thinker' in the contemporary literature. For example, Bonn (2001), says that in order to remain competitive today, the ability to think strategically has become crucial and organizations that successfully integrate strategic thinking at individual and organization level create a core competency that forms a basis for enduring competitive advantage. Liedtka (1998) and Tavakoli and Lawton (2005) stresses a need for strategic thinking in a similar way and states that firms that are able to fuse strategic thinking ability throughout the organization will create and sustain a competitive advantage. The greater the number of people in the organization, capable of doing good strategic thinking, the better the chances of a firm being responsive and innovative (Tavakoli and Lawton, 2005).

However, even though strategic thinking has been discussed with increasing frequency, contributing to the current understanding of what it entails, there is no conclusive definition of what strategic thinking is (Bonn, 2001). Despite there being widespread consensus on how crucial strategic thinking is (Mintzberg, 1994a, b; Bonn, 2001; Graetz, 2002; Tavakoli & Lawton, 2005), there is no usable or tangible method of assessing this ability. Furthermore, the inability to practice effective strategic thinking by organizations has already been alluded to in the current literature, with Liedtka (2011) stating that the gap between strategic rhetoric and strategic action remains frustrating. Bonn (2001) highlighted the same with an example of an executive who states that 'it is a major challenge to get our decision makers to think in strategic rather than operational terms' (Bonn, 2001, p. 63).

Whilst measures to enhance strategic thinking in organisations have frequently been put forward, including the involvement of middle managers in strategic decision-making processes and reward based systems that include a high proportion of qualitative performance measures (Bonn, 2005, p. 348). But all these are artificial means of encouraging individuals to utilize their strategic thinking capacity in an organization. This does not address the underlying problem of understanding the level of strategic thinking proficiency of employees within the organisation, and how individual ability may be effectively quantified or measured. To address these wider questions, an ongoing research project is currently being conducted at the Lund University School of Economics and Management which intends to break new ground by identifying a way of refining how we consider, evaluate and measure strategic thinking in individuals. This study presents the first phase in this process and aims to identify what strategic thinking is, and then measure and isolate strategic thinking ability in practice through the use of CPP, and current knowledge of strategic thinking within the theory.

## 1.2 Problem Discussion

The question ‘what is strategic thinking’ is one that has been asked and examined by many leading academics and professionals in recent decades (Mintzberg, 1994 a,b; Heracleous, 1998; Liedtka, 1998, 2011; Bonn, 2001, 2005; Graetz, 2002, Allio, 2006; Steptoe-Warren et. al, 2011, Nuntamanop et. al., 2013, Olson & Simerson, 2015), however numerous different interpretations have emerged of what strategic thinking means, involves and what concepts are evidential of strategic thinking in the literature. There is no definitive list of these themes and concepts to refer to, and no conclusive means of measuring strategic thinking ability in-turn. CPP, an online problem-solving platform, which could be viewed as an approximation of what strategic thinking entails, offers a potential solution by measuring strategic thinking ability of individuals in practical and reliable manner. But, until now, CPP has yet to be scrutinized for its ability to measure strategic thinking in line with the concepts identified through the academic literature. The role of experience, background, and exposure in strategic thinking has also been hypothesized upon but never subjected to any kind of measurement. Hence, we intend to explore and find possible solutions to these problems and in doing so provide a valuable contribution to the current understanding and future development of strategic thinking.

## 1.3 Purpose & Research Questions

The purpose of our study is to identify what strategic thinking is, to consider if we are able to measure and isolate this ability through the use of CPP and our current knowledge of strategic thinking in theory, and to examine whether work experience and educational background influence the ability to think strategically. To achieve these aims, we conducted a literature review of how strategic thinking is defined in academic publications to synthesize our knowledge, and to identify the most prominent competencies that enable individuals to think strategically. We then selected 40 individuals according to specific criteria outlined in our methodology. Each of our participants completed a background questionnaire, the CPP assessment, and then we selected certain individuals to interview in more detail to address our second and third research questions. The findings of our research are intended to address the current research gap on how to measure strategic thinking ability, provide a more comprehensive approach to our current understanding, and to examine where to go from here. The results of this study are highly beneficial to organizations seeking to acquire employees that think strategically, and individuals who wish to develop their own strategic thinking ability.

In recognition of the objectives identified above, we have identified three research questions that we wish to address in this study:

1. *What is Strategic thinking?*
2. *Does CPP measure the strategic thinking ability of an individual? Can we isolate this ability through the use of CPP and implementing our knowledge of the core competencies of strategic thinking?*
3. *Does work experience and educational background have any influence on the ability to think strategically?*



## **1.4 Research Limitations**

Our research has identified certain limitations that we wish to outline. The first limitation concerns the stringent time limits we adhered to i.e. 10 weeks. This limited our capability when it came to sourcing participants for the study itself to 40 individuals. Ideally, our research would have involved a higher number of participants to allow for further analysis and to consider CPP results across additional variances (e.g. specific years of experience, specific degree subjects or specific professions compared and contrasted with one another). Second, this study required participants to assess themselves via background questionnaire and in-depth interview which at times may be subjective and variable. Additionally, we had limited time to compile a list of questions for our in-depth interviews, meaning we had to swiftly decide on a course of action, perhaps without adequate consideration for additional weighting to the highly-structured questions posed. Lastly, once the CPP assessment is taken by an individual, they are not allowed to take it again. Therefore, we cannot validate our findings through having our participants undergo CPP assessment a second time, and seeing whether the results will be similar or not.

## **1.5 What is CPP: A Brief Introduction**

Developed by Dr. Maretha Prinsloo, Cognitive Process Profiling (CPP) is an online problem-solving assessment that user takes in a monitored, unfamiliar environment and measures the user's behaviour through their actions by means of advanced mouse tracking capability (Cognadev Technical Manual, 2016). The CPP assessment is able to measure a number of intellectual constructs such as judgement, intuition, creativity, complexity, preferences etcetera. To date, it has been validated and licensed for use and tested on over 200,000 unique individuals, with a detailed technical manual that explains its functioning and use (Cognadev Technical Manual, 2016). In the assessment, users are tasked with compiling a total of eight stories by interpreting the message that is conveyed by the symbols on the cards that are also supposed to be manipulated on the screen through the use of a mouse (Cognadev Technical Manual, 2016, p.8).

## **1.6 About our Study**

The first thing we needed to do was to address our first research question, what is strategic thinking? To do this, we conducted a thorough literature review to define strategic thinking, and to identify its core competencies present across multiple, valid sources. This knowledge was then used to assist us in answering our next research questions, inclusive of the CPP assessment itself. We then non-randomly selected participants for our study, with 26 candidates (students) being drawn from the Lund University, and 14 candidates (managers and executives) with varying degrees of experience from the corporate environments. Participants were then assessed at a monitored, unfamiliar venues, and completed a background questionnaire and the CPP assessment. After all assessments were completed, in-depth interviews were conducted with 14 selected participants, relating to the core concepts identified of strategic thinking to see if this ability can finally be measured, isolated, and assessed for influences.

Once we collected all the data from background questionnaires, CPP assessments and interviews, we were in a position to analyse our findings to address our 2nd and 3rd research questions. Our full methodology is outlined in chapter 2.

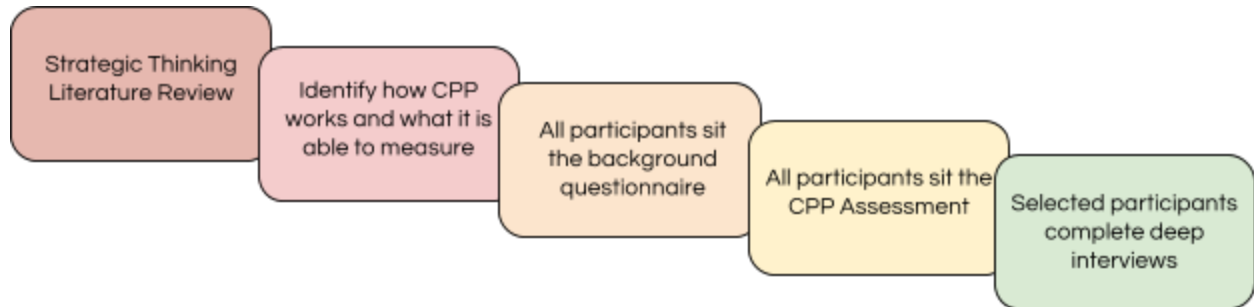


Figure 1: A Summarized Study Approach

## 2. Methodology

This chapter provides an overview of the scope of our project, the philosophy, research design, research approach, data collection methods, and analysis used to answer our research questions. ‘The research onion model’ proposed by Saunders Thornhill & Lewis (2007) demonstrates the structure of the methods that we have utilized in our research.

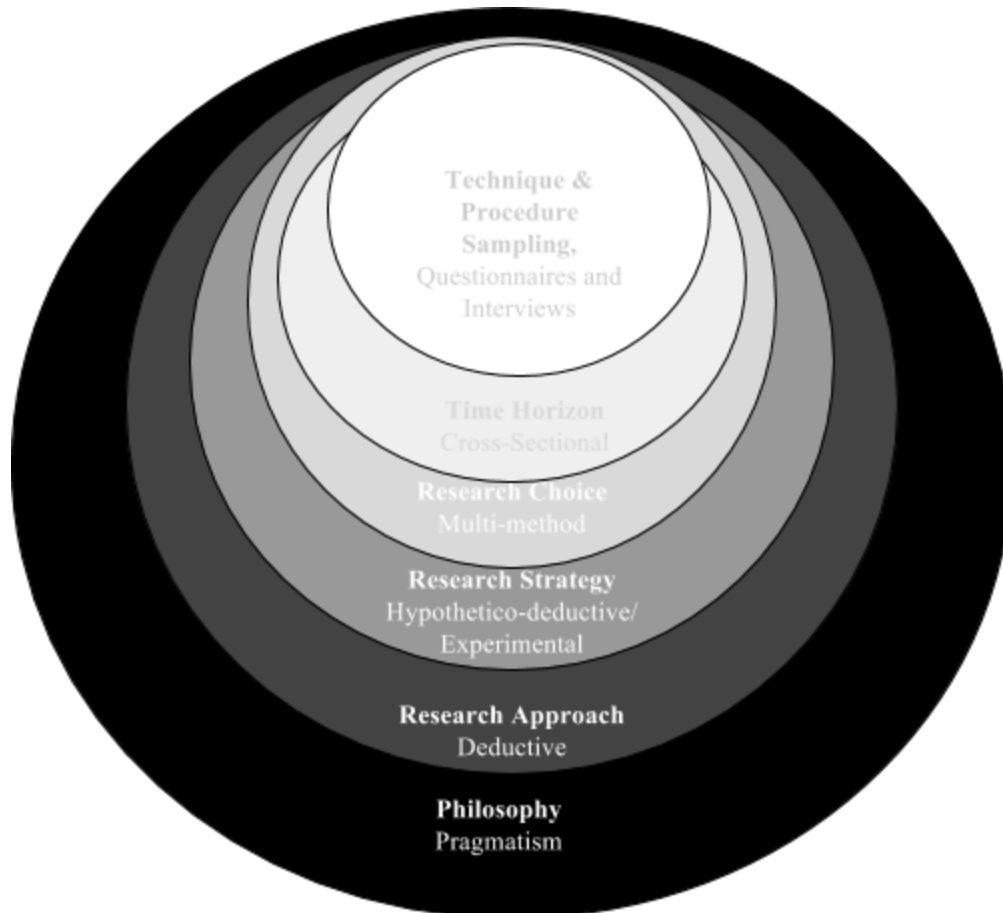


Figure 2: Research Onion based on Saunders, Thornhill & Lewis (2007)

### 2.1 Overview of our Methodology

To conduct our study effectively and address our research questions, we followed a precise step-by-step method. Our methodology helped us to identify potential pitfalls and ways of tackling them to ensure valid and relevant results in our research. The steps involved in our method are outlined below:

### *Literature Review*

The first thing we needed to do was to address our first research question, what is strategic thinking? To do this, it was imperative that we conducted both an extensive and objective literary review. We compiled and reviewed the literature on existing strategic thinking research spanning from 1938-2016 through multiple methods. We searched the LUSEM library and online databases including Google Scholar and ResearchGate. We examined journals such as Harvard Business Review, the Journal of Strategy and Management, Long Range Planning and many others. After reviewing the literature methodically, we identified key themes and concepts and then grouped these into our own research guide to reflect on the similar and conflicting arguments. It was vital to ensure we were reviewing an extensive database of research to establish confidence in our definition of strategic thinking, as this knowledge would be used throughout our study, therefore we also drew upon both the knowledge of subject experts and different perspectives around strategic thinking. We contacted experts who identified different approaches to strategic thinking such as the use of cognitive maps and mental modelling techniques, and to allow us to consider different perspectives. Additionally, we conducted a detailed review of the role of strategic thinking in strategic planning and strategic decision making.

### *The CPP Assessment*

Once completing the literature review, defining strategic thinking, and agreeing on the core concepts evident through reviewing all sources, the next step was to address our second and third research questions. The first question here was whether CPP is able to measure strategic thinking of an individual? The CPP technical manual indicates that the assessment measures your likely ability to function in certain work environments (from pure operational on one end to pure strategy on the other), meaning the more you operate towards the pure strategy work environment, the more likely you are to exercise strategic thinking (Cognadev Technical Manual). In brief, this indicated to us that there are many parallels to potentially be drawn between strategic thinking and the CPP assessment itself. In chapter 4, we identify how the CPP assessment works, what specific constructs are measured, which of these are important to our study and how feedback is distributed. However, to substantiate and validate this capability, our own self-assessment tools would have to be developed to try measure and isolate strategic thinking directly, and our literature review formed the basis of the tools we developed to address this challenge. The CPP assessment sessions were completed in monitored locations in Lund & Stockholm with a licenced facilitator always present at sessions.

### *Participant Background Questionnaire*

The first self-assessment method we developed to measure and isolate strategic thinking ability of individuals and to compare with CPP was a background questionnaire completed by all 40 individuals taking part in our study. The questionnaire was completed via Google Forms and results were automatically collected from each respondent. The questionnaire was divided into two sections as we wanted to collect different types of information from each participant to help us address all areas of our research. The first section provided an overview and background information about each of the 40

respondents including general information such as age, gender, and nationality. We then identified whether each respondent was a student or a manager/executive, the respondent's bachelor and postgraduate qualifications, the duration of the respondents managerial/executive work experience in years, and a brief description of the respondents work experience. The reason we collected this information was to aid us in our analysis and results where we would be examining to see if correlations were evident across all these variables. The second section required the respondent to answer simply stated questions relating to the core concepts of strategic thinking directly related to our literature review. For example, the questions asked the respondent to assess how creative they are (in general) and if they always tried to synthesize all the information available to them in a particular scenario (see Appendix A for full list of questions). These questions were presented in a Likert scale to provide us with quantifiable values to base the respondent's self-assessment upon. Answers with value 4 or above (typically indicative of answering 'often' or 'important') were assigned 1 point, and value of 3 and below assigned 0 point.

### *In-Depth Interviews*

The second self-assessment method we developed to compare with CPP and to examine in more detail the understanding and reasoning of the respondents was an in-depth interview. Questions were selected relating to the core concepts of strategic thinking, with the intention of cross-analysing the data with the questionnaire and CPP assessment results. Interviews were carried out double-blind to avoid any bias and we were only aware of the respondents CPP results following completion of all the 14 interviews. A third party selected 14 interview participants (8 students, 6 managers/executives) based on specific selection criteria outlined in 2.5.2.

The format and the exact list of questions posed during the in-depth interviews are listed in full in Appendix A in the order they were put to each respondent. All questions were related to the core concepts of strategic thinking as identified through our literature review. Respondents were asked 48 questions in total, and scoring was pre-coded based upon our interpretation of strategic thinking in the literature, with 1 point assigned to an answer reflecting the literary interpretation of an element of strategic thinking, and no points for failing to answer a particular question, or providing an answer that failed to demonstrate awareness or use of strategic thinking concepts. Questions were both closed (e.g. are you invited to any events or workshops because of your creativity? Y/N), and open ended, where a more developed and interpretative approach had to be taken to both our answer and our interpretation of the answer of the respondent. Interviews ranged from between 32 - 73 minutes in duration, with no time limit specified for each interview, however, the interviewer was able to move the process along once a sufficient answer was provided from the interviewee.

### *Challenges Encountered Based on our Methods*

Developing and utilizing our own self-assessment tools to provide relevant data to compare and contrast with the non self-assessment method of CPP proved challenging. Since this was a unique and experimental strategy, the first of its kind, compiling questions for the questionnaire and in-depth interview from the concepts we identify to be relevant to strategic thinking ability came with substantial

risks. There was no source available we could refer to when formulating the list of questions and asking one irrelevant question had the capacity to disrupt the valid correlations formed when analysing the data. This raises the challenge of identifying valid and reliable correlations between strategic thinking as a concept in itself, and the CPP assessment. For valid correlations to be drawn, the data we had sourced on strategic thinking also had to be valid, and for this reason we were very detailed in compiling our literary review, as this review provided the basis for the questionnaire and interview questions.

A further challenge we identified was the difficulty assessing which strategic thinking competencies to include and exclude within our literature review. To address this, we adopted an approach whereby a theme or concept had to be validated in multiple credible sources. Another difficulty encountered with self-assessment tools: background questionnaire and in-depth interviews was that we were reliant on an individual's ability to self-assess themselves, an aspect which may vary from person to person. An additional point we wish to address concerns the participants of our study. We had intended to assess 50 participants in total, 25 students and 25 managers/executives, however, we were only able to assess 40 individuals in the time-frame allotted, 26 students and 14 managers, with 39 completing all required components. Finding 40 participants to participate in our study required great effort considering we needed a considerable investment in time from each individual, and they had to physically attend an assessment day at a specified location. Feedback days and online seminars have been offered for this purpose to participants to ensure they attain full value for their contribution to our research.

## **2.2 Research Philosophy**

Saunders, Thornhill & Lewis (2007) characterize research philosophy as relating to the development and nature of knowledge whilst also containing important assumptions about the way in which we view the world. We believe that Strategic thinking is a relatively socially constructed concept, so we are not attempting to prove how the world works instead, we are building ideas to explore the world. Our study adheres to the philosophy of pragmatism, in that the most important determinants of our philosophical approach are the research questions themselves, and one approach may be better than another for answering particular questions that relate to our study (Saunders, Thornhill & Lewis, 2007). In other words, this study takes a largely constructivist epistemological stance that accepts the value of collecting multiple data sources (Easterby-Smith, Thorpe & Jackson, 2015).

## **2.3 Research Approach**

This study was carried out in a deductive manner as it involved developing upon existing theory and then subjecting this theory to a rigorous test (Saunders, Thornhill & Lewis, 2007). Robson (2002) identifies five sequential stages through which deductive research progresses, the first three stages being: deducing the hypothesis, expressing it in operational terms, testing the operational hypothesis. Next two, examining the specific outcome of the query and modifying the theory if required in light of the findings. This process is precisely how our research was conducted, where our hypothesis was stated by questioning if we are able to measure strategic thinking through the CPP assessment, followed by introducing our core

concepts relating to strategic thinking where we propose a potential relationship between these concepts and CPP. The hypothesis is then tested through surveying, CPP assessment, and selected interviews, the outcome examined and the theory modified if required (Saunders, Thornhill & Lewis, 2007). Concerning generalization when it comes to our deductive study (Saunders, Thornhill & Lewis, 2007), it was imperative that we source an adequate number of participants to avoid reaching generalizations. Whilst the final number of participants will later be expanded upon during the ongoing research following this study, a lot of time was invested in recruiting an adequate number of participants (40) to help us avoid generalizing.

## **2.4 Research Design**

A lot of quantitative data will be generated while assessing CPP's capability as a measurement tool via scored surveys and highly structured interviews. Therefore, a multi-method quantitative focused approach was most suitable to help corroborate our research findings, allowing us to use statistical methods to enhance the objectivity and validity of our results (Saunders, Thornhill & Lewis, 2007). As our study is deductive and based upon approaching our hypotheses through a multi-layered, multi-method approach, it is difficult to label our research design as adhering to one particular or exact approach. It involves literary review, surveying, and in-depth interviews to provide insights towards our experiment. Hence, we believe this study to be best described as a hypothetico-deductive, experimental strategy.

## **2.5 Time Horizon**

This study was conducted under a limited time frame, as an academic research project and therefore a cross-sectional approach was selected through necessity. As well as surveying and experimentation, our study involved completing 14 in-depth interviews in a very concise period of time (all 14 interviews were conducted across a 14-day time period) and hence adheres to the cross-sectional approach (Saunders, Thornhill & Lewis, 2007).

## **2.6 Data Collection Method**

All participants attended a monitored assessment with a licenced Cognadev facilitator present at two selected locations: Lund & Stockholm, Sweden. In total 40 participants attended our assessment days, with 39 participants completing all the required components. Participants were contacted to participate in the study via a range of methods: in-person, via email, LinkedIn, and by telephone. We selected participants non-randomly with a view to improve our ability to measure and isolate Strategic thinking ability. Our main objectives were to analyse a number of constructs in line with our research questions, inclusive of background, looking specifically at the differences identifiable through the postgraduate degrees, where some individuals had an engineering background, and others a non-engineering background. A further aim was to examine the level of work experience, from students with minimal experience to managers and executives with comprehensive experience.

To summarize, participants themselves were sourced from four distinct backgrounds:

- 1.) Postgraduate students with an Engineering background
- 2.) Postgraduate students with a non-engineering background
- 3.) Managers/Executives from an engineering background
- 4.) Managers/Executives from non-engineering background

### **2.6.1 Sampling Method**

Participants were initially selected on a non-random basis through the principles of quota sampling, to enable us to assess individuals who met with the background criterion we wished to examine (Easterby-Smith, Thorpe & Jackson, 2012). An initial advantage of quota sampling was that we could recruit participants according to our criteria quickly, and this method offers the highest attainable likelihood for a representative sample considering the time available to us (Saunders, Thornhill & Lewis, 2007). Following completion of the CPP assessments, participants were then selected for in-depth interviews through maximum-variation sampling. This sampling strategy was deemed to be appropriate as selection was based on the range of incidents of a given phenomenon, inclusive of extreme cases based on their assessment results (Easterby-Smith, Thorpe & Jackson, 2012). That means for the two categories - students and managers/executives, the participants were classified according to their educational background engineering/non-engineering and then each class was ranked according to their (1) current level of thinking and (2) potential level, then from the top and the bottom score, two participants were selected. If the number of available respondents were larger than two, a random selection (lottery) was used to identify a participant for the interview.

### **2.6.2 Data Collection from a Multi-Method Quantitative Approach**

As we employed a multi-method quantitative approach, all methods of data collection utilized can be deemed to be quantitative. The participant background questionnaire was required to be completed by all 40 participants, with questions based upon their self-perception of core concepts relating to strategic thinking identified through the literature review (Appendix A). Following this, all the participants took the CPP assessment which has its own unique data collection method. Lastly, 14 purposefully selected individuals were subjected to quantitative, highly-structured interviews presented in a pre-defined order (Appendix B).

#### *The Participant Background Questionnaire*

The participant background questionnaire was a self-completion survey that served as our first source of primary data requested from all 40 participants. Easterby-Smith, Thorpe & Jackson (2012), identify that for quantitative studies aiming for representation, sampling strategies aim for samples that represent a large population. For this reason, we accumulated as large a population of participants as was feasible in the time allocated. We asked participants to complete our background questionnaire, employing the use of open-ended and closed questions separated into two distinct sections. The first section required general



information on the participant (age, nationality, educational background, experience etc.). The second section examined our participants perception of the core themes of strategic thinking through relatively simplistic questions, using active tense where possible (e.g. to what extent do you consider yourself analytical? how creative are you? etc.), and simple expressions to ensure clarity and understanding (Easterby Smith, Thorpe & Jackson, 2012). The full list of questions presented to each individual candidate can be found in Appendix A.

Prior to finalizing the format and questions posed in the questionnaire itself, we presented our draft edit to a third party to enable us to refine our research instrument (Bryman & Bell, 2011). As part of a concise pilot study to enhance the reliability and validity of our tool (Saunders, Thornhill & Lewis, 2007), we asked our third party to suggest critical amendments to all aspects of the questionnaire itself, and following this a two-section format was rigidly adopted, and three closed questions were restructured. The questionnaire itself was compiled using Google Forms, to allow participants to self-complete their responses. The names of respondents were requested on the questionnaire to allow us to match responses to the CPP assessment results. However, all details were kept anonymous.

### *The CPP Assessment*

As the CPP assessment is developed and licenced by Cognadev, it is important here to note that data is collected by use of the assessment's own customized algorithm method. Due to the customized method used to collect data on each participant, interpretation of the data for each individual is conducted by Cognadev, and we were provided with in-depth and highly relevant secondary data to analyse once this was completed. The data we accessed from Cognadev contained the data sheets detailing each participant's results in numerical form to display cognitive style rankings (from 1-14, most utilised to least), ranking of their current and potential work environments in a numerical form (1 = Pure Operational to 5 = Pure Strategy), and information processing competencies (scored out of 100).

### *In-depth Interviews*

As we did in the formulation of our background questionnaire, once the draft edit of the in-depth interview was complete, a third party was asked to sit a short pilot study in the form of a mock interview. This was done to suggest critical amendments to all aspects of the interview process, and to once again allow us to refine our research instrument (Bryman & Bell, 2011). One of the advantages of conducting a mock interview was to allow us to gain insight into the pace and timing of the process itself, with our intention being that each interview should be around the hour mark but with no mandatory set time allocation. For each interview, the only instruction issued was that the interviewer should progress to the next question after a satisfactory answer was provided. Following the mock interview, 2 questions were merged upon the recommendation of the third party, and 1 question was omitted as it was deemed to be irrelevant. The mock interview duration was 1 hour and 4 minutes prior to being edited to produce our final version.

The in-depth interview was conducted after the completion of background questionnaire and CPP assessment. The Interviews were conducted by both of us individually to meet the stringent time deadlines required, and all interview questions were asked in the same order, and in a neutral tone. To eliminate any form of bias, a third party selected the interview candidates as outlined by the criteria designed to provide the maximum-variation of respondents, and we were unaware of all interviewees results from the CPP assessment whilst conducting interviews. All interviews were conducted remotely via Skype audio to ensure parity and to allow us to interact with interviewees based across Sweden easily. All the interviews were also recorded to ensure the objectives outlined above were met, and all details following the interviews themselves were held anonymous with strict confidentiality. In total, 14 in-depth interviews were completed (8 student interviews and 6 managers/executive interviews), and the details and general background of each participant are outlined in the tables below:

### Student In-depth Interviews

Student	Undergraduate Degree(s)	Professional Work Experience (years)	Engineering/Non-engineering Background	Interview Duration (mins)
S1	Petroleum Engineering	0	Engineering	54
S2	Geology	0	Non-engineering	49
S3	Personnel Management & Organisational Psychology	0	Non-engineering	52
S4	Foreign Language & Culture (German and Italian)	0	Non-engineering	40
S5	Chemical Engineering	0	Engineering	50
S6	Industrial Engineering	0	Engineering	55
S7	Psychology	0	Non-engineering	53
S8	English Language & Literature	2	Non-engineering	43

Table 1: In-depth interviews: Students

## Managers/Executives In-depth Interviews

Executive	Undergraduate Degree(s)	Professional Work Experience (years)	Engineering/Non-engineering Background	Interview Duration (mins)
ME1	Business Administration, Organisation & Leadership, Comparative Literature	6	Non-engineering	56
ME2	Chemical Engineering	2	Engineering	58
ME3	Civil Engineering	7	Engineering	73
ME4	Business Studies, Psychology	4	Non-engineering	49
ME5	Economics, Business Administration	1.5	Non-engineering	60
ME6	Industrial Engineering and Management	6	Engineering	32

Table 2: In-depth interviews: Managers/Executives

## 2.7 Data Analysis

Utilizing a multi-method quantitative approach in our research involving surveying, assessing and interviewing to attain results, each data set we collected required analysis separately, and on an individual basis initially. This was to assess the validity and to examine our preliminary discoveries prior to cross-analysis of the data with the aim of identifying potential correlations. The results of our analysis were also combined to compare and contrast participants across multiple variables, and to increase the credibility of our findings. Saunders, Thornhill & Lewis (2007) note that quantitative data in raw form conveys little meaning and therefore requires processing to be useful, and as our study involved drawing findings and correlations from multiple, often complex sets of data, an effective translation was of paramount importance. Saunders Thornhill & Lewis (2007) note that quantitative data can be divided between categorical and quantifiable, and as the data collected from our background questionnaire and interviews fall into both strata, we used multiple methods to assess the data collected.

### 2.7.1 The CPP Assessment

The results of the CPP assessment for each participant in our study were formulated and validated by Cognadev themselves prior to being made available to the facilitator. The facilitator then shared only statistical and numerical information relevant to our study, from the comprehensive reports compiled for each participant. This was done to maintain the anonymity of the participant's data. The data we accessed

from Cognadev contained the data sheets detailing each participant's results in numerical form to display cognitive style rankings (from 1-14, most utilised to least), ranking of their current and potential work environments in a numerical form (1 = Pure Operational to 5 = Pure Strategy), and information processing competencies (scores out of 100). This allowed us to easily manipulate this ordinal data through the use of Microsoft Excel to identify correlations and perform regression analysis through the use of inbuilt formulas.

Statistical data analysis software was considered however we decided against its use due to a number of factors, namely the size of our study in terms of participants, the time available to us, and the effectiveness of Excel to calculate correlations and other variables considered. Testing between two variables from the assessment was undertaken frequently to confirm or disconfirm correlations. An example of this was to compare in-depth interview scores with CPP work environment scores to examine whether there are positive or negative correlations between two variables (Easterby-Smith, Thorpe & Jackson, 2012). When this was established, and evidence of a potential correlation found, we would then experiment by removing either a set of scores on questions relating to a specific concept of strategic thinking in our interview questions, or work environment scores to see if this affects the correlation positively or negatively. We would then continue in this method by removing an additional variable or multiple variables or adding them back to see how this affects a potential correlation.

### **2.7.2 Background Questionnaire & In-Depth Interviews**

#### *The Background Questionnaire*

The Background Questionnaire responses were collected through Google Forms, a platform that provides its own initial analysis of data collected. This allowed us to make use of inbuilt graphs, charts and diagrams to assess quantifiable data, for instance when examining structured questions measured according to the Likert Scale, and descriptive data, i.e. experience and background related-questions. The data was then adapted in Microsoft Excel for further analysis.

#### *In-depth Interviews*

As interviews were conducted using maximum-variation sampling to select the participants based on factors inclusive of background, experience, and the work environment, our initial data analysis was often conducted in the form of line graphs to allow us to identify the highest and lowest variables present in the discrete data. This method was mostly utilized due to the interviews being scored according to pre-coded answers prior to more in-depth analysis, with histograms utilized to examine continuous data on questions where we wished to examine a user's interpretation rather than their score (Saunders, Thornhill & Lewis, 2007).

## **2.8 Data Quality**

### **2.8.1 The CPP Assessment**

The CPP assessment is developed and licenced by Cognadev, and the primary data is sourced directly from them to calculate and verify each participant's results, however, it is our responsibility to ensure the reliability of the research instrument utilized in our study. To this end, it is notable that in a period of over two decades since its inception, the CPP Assessment has undergone extensive refinement through qualitative and quantitative means to continuously enhance its capability, with a number of validity and reliability studies conducted on the platform with archived results (Cognadev Technical Manual, 2016).

### **2.8.2 Background Questionnaire & In-Depth Interviews**

Bryman & Bell (2011) note that any researcher who develops a new measure should ensure it has face validity, meaning this measure reflects the content of its concept. As our purpose and the research questions used to address it were completely untested in any prior study, we were required to develop our own tools to conduct our research. We did so in the form of the background questionnaire and in-depth interviews to formulate our answers, therefore ensuring their validity was imperative to us. Saunders, Thornhill & Lewis (2007) emphasize that structured interviews and questionnaires should be based on a predetermined standardized or identical set of questions, and pre-coded answers used in the results process (Saunders, Thornhill & Lewis, 2007, p. 312). To enhance the credibility of a questionnaire and interview process we developed ourselves, all these criteria were rigidly adhered to. Another aspect of quality assurance Saunders, Thornhill & Lewis (2007) recommend is a pilot study to refine the questionnaire and interview questions themselves, and to this end, we subjected both our background questionnaire and in-depth interview questions and formats to test-runs prior to finalization.

## **2.9 Limitations**

Whilst entering into completely uncharted research territory, our study proved highly stimulating, and allowed us to explore and develop new ideas and concepts to address our purpose and research questions. It is evident that when entering unknown territory, a detailed understanding of the limitations of the study itself is imperative to ensure an objective approach and to avoid coming to naive conclusions. An initial consideration being that whilst the CPP is a non self-assessment platform, our background questionnaire and in-depth interview questions required participants to self-assess their abilities, and proficiency across concepts relating to our interpretation of strategic thinking, raising a number of questions and concerns. Are all individuals proficient at assessing themselves? Do they have the ability to assess themselves in certain areas? Does this ability develop with work experience? Indeed, these are questions considered in our discussion, and present a challenge to our research which may only be resolved through measures such as a highly structured approach, pilot testing, avoiding biases, and ensuring a complete understanding of the questions (Easterby-Smith, Thorpe & Jackson, 2012).

A potential future improvement would, of course, be a larger sample size to increase the level of objectivity, which is being considered in the future research. Time limitations coincided with our requirement to complete a considerable number of in-depth interviews to enhance the validity of our findings and results, and therefore each of us completed a proportion of the interviews individually to ensure their successful completion. To avoid any form of bias and to ensure the validity of each interview we applied a number of measures. All interviews followed a highly-structured format and were conducted in the exact same manner (Skype audio). Questions were asked in the exact same order and scored by an agreed and pre-coded interpretation manual that was finalized in advance of the interviews themselves (an expanded version of the answers found in Appendix B). The interview candidates were selected by a third party to ensure objectivity, and importantly we had no prior knowledge of participant's CPP assessment results until completion of the interviews to ensure neutrality.

Lastly, in terms of addressing our data collection methods and analysis, the quota sampling method was used to source participants in line with our objectives, whereby the CPP assessment results assisted us in determining candidates for in-depth interviews. Our reasoning being to procure a suitable range of participants for our study. It is however noted by Saunders, Thornhill & Lewis (2007), that quota sampling is typically utilized in larger populations, and with more time available we would have aimed to increase the size of the sample population, however, this technique proved suitable for the scope of our study. Statistical data modelling software was not used in this study as Excel was able to measure formulas and regression values as required, however, with a larger time-frame we would have considered their use to add further dimensions to the analysis.

### ***Chapter Summary***

This chapter provided an overview of the method that is applicable throughout our study. Through a pragmatic philosophy and a deductive approach, we addressed each of our research questions through a multi-method quantitative research design. Quantitative findings from initial data sourced from our background questionnaire, and then through the CPP assessment was utilized alongside pre-specified criteria to conduct the in-depth interviews.

### **3. Theoretical & Literature Review**

The aim of this chapter is to provide the reader with an explanation of why strategic thinking is important to both individuals and organizations, a detailed review of the core themes and concepts of the strategic thinking, examine the current schools of thought, and to highlight the importance of strategic thinking in the context of our study and research questions. We intend to examine models that highlight relevant approaches to strategic thinking, and lastly to provide our own interpretation of what strategic thinking is and its core concepts and our reasoning for this.

#### **3.1 Introduction: A Lack of Consensus**

We should start by stating outright that there are many different dimensions and definitions of what strategic thinking involves (Nuntamanop et. al., 2013). However, there is no definitive answer to what strategic thinking actually is (Bonn, 2001), and that the term itself has been exercised with such regularity in the field of strategy that it is at risk of becoming ‘meaningless’ (Liedtka, 2011). The resultant knowledge gap may be contributory to strategic thinking being identified as a major shortcoming within organizations (Bonn, 2001). Bonn (2005) further asserts that strategic thinking has long been a topic of significant interest within the field of strategic management, yet the vast majority of studies have failed to address the cognitive dimension of decision-making, particularly in relation to how strategic decision makers actually think. It is this dimension of strategic thinking that holds a particular interest to us, and identifying how individuals think and measuring this ability is fundamental to our research. Therefore, it is our intention to highlight what strategic thinking is, and contribute to the groundwork in establishing certain basic parameters of what strategic thinking incorporates through our literary review, and then use these theories to develop our own self-assessment tools (background questionnaire and in-depth interview) and compare them against the CPP assessment itself.

#### **3.2 Schools of Thought**

Whilst it is evident that strategic thinking has been an emerging area of focus for organisations and in the field of management for decades now, it is important to consider and address the multi-disciplinary and multi-dimensional scope of the research done on strategic thinking. For example, Steptoe-Warren et. al. (2011) have identified considerable theoretical and empirical research both in management and psychological disciplines, while examining strategic thinking, and the relationship between strategic thinking and strategic decision making. In additions to this, cognition is also frequently identified as being instrumental to strategic thinking in both psychology and management journals. As well as the relationship between strategic planning and strategic thinking and the distinction between strategic thinking in individuals and strategic thinking in groups and organizations. Hence it is vital that our literature review incorporates all schools of thought present in the literature. Our review also considers common themes, concepts, and characteristics of strategic thinking, and where literary sources agree, as well as areas they disagree upon and present conflicting or divergent views to strategic thinking. In doing so, we intend to clarify what it means to think in a strategic way, which is not clear in the literature. Lastly, our literature review considers the role of background, experience, and exposure upon strategic

thinking ability, vital in addressing our final research question whether background or work experience plays a role in the ability to think strategically.

Even though there is no definitive agreement on what strategic thinking entails, there are some common thought processes and characteristics that numerous literary sources find consensus on. For example, strategic thinking being visionary, creative, and synthetic is a school of thought that many authors argue in the literature (Nuntamanop et. al., 2013). However, when it comes to incorporating all or some of these concepts, the literary sources tend to have different approaches. Bonn (2005) presents systems thinking, creativity and vision as key elements of strategic thinking. Mintzberg (1994a, b) separates strategic planning and strategic thinking, believing strategic thinking to be about synthesis and involving intuition and creativity. Heracleous (1998) identifies strategic thinking as being creative, synthetic, and divergent. Divergence is a concept of strategic thinking highlighted by Schoemaker et. al. (2013), who state that strategic thinkers challenge the status quo and encourage divergent viewpoints. Whilst Bonn (2005) examines strategic thinking as a way to solve complex problems by combining a rational, convergent approach with a creative, divergent thought processes (Bonn, 2005 p. 337).

Whilst the concepts emphasized, and the perspectives of the authors differs in the sources discussed so far, the vast majority widely agree on the general principles behind effective strategic thinking, namely creativity, systems thinking and vision as is evident in the work of Bonn (2001, 2005) Graetz (2002) Liedtka (1998, 2011) amongst others. Heracleous (1998) however points to an area in the field of strategy that has caused a divergence of opinion with differing schools of thought, where Mintzberg (1994a, b) has a process focussed approach to strategy and Porter (1996) adopts a positioning focussed approach (Heracleous, 1998). This he states has led ‘proponents to suggest corresponding thinking modes for the aspect of strategy they focus on; Mintzberg emphasizing the creative and synthetic, and Porter emphasizing the convergent and analytical’ (Heracleous, 1998, p. 485). It is noticeable from this divide, that the concept of being analytical in strategic thinking also divides opinion, and is largely discussed by a different selection of authors. The role analysis plays in strategic thinking also differs amongst sources. Allio (2006) for example makes reference to analytical tools such as market segmentation and SWOT analysis and argues to have enhanced strategic thinking ability, whereas Hussey (2001) focuses on the relationship between analysis and creativity, believing when both are done well the resulting strategies should be sound and innovative. Hussey (2001) also notes analysis is not always objective and can be influenced by behavioural considerations. Lastly, Heracleous (1998) proposes that creative, divergent strategies that emerge from strategic thinking should be fused with convergent, analytical thought to achieve the most effective outcomes.

A systemic approach to strategic thinking is one argued by multiple literary sources in our review. Olson & Simerson (2015) propose that systems thinking will help to broaden the range of factors an individual considers when ‘identifying options and prioritising actions’ (Olson & Simerson, 2015, p. 22). Whilst Senge (1990) considers the organisational approach towards strategic thinking, identifying systems thinking as viewing the organization as a complex system affected by factors that occur on internal and external levels. Liedtka (1998) expands on systems thinking from an organisational perspective. She believes that strategic thinking is reflective of a systemic or holistic view, where a strategic thinker considers the external ecosystem where an organisation operates alongside internal aspects of an



organisation and interrelationships, that taken together comprise the whole organisation (Liedtka, 1998, p.122). Whilst Liedtka (1998) incorporates systems thinking into five distinctive concepts that also includes strategic thinking being intent-focused, characterised by intelligent opportunism, thinking in time and hypothesis driven, Bonn (2005) in her multilevel approach incorporates systems thinking with creativity and vision.

There are many other concepts and characteristics noted by multiple sources within our literature review, including the role of reflection in strategic thinking that is emphasized by multiple authors (Bonn, 2001 2005; Argyris, 2002; Frederick, 2005; Schoemaker et. al., 2013; Bowman, 2016). Being intuitive and making use of intuition in a working environment is identified by a core concept by numerous sources (Mintzberg, 1994a, b; Liedtka, 1998, 2011; Graetz, 2002; Nuntamanop et.al., 2013; Olson & Simerson, 2015), as is being future oriented by perspective (Hamel & Prahalad, 1994; Linkow, 1999; Bonn, 2001, 2005; Allio, 2006). We also wish to draw attention to those authors with differing approaches to strategic thinking than those we have previously identified. Linkow (1999) identifies the crucial elements of strategic thinking to include abstracting, inducting, multivariate thinking, reframing, scanning and valuating alongside envisioning. Olson & Simerson (2015) fuse game theory, the study of decisions that involve two or more parties with the previously discussed systems thinking and cognitive psychology to formulate their three components of strategic thinking.

### *Strategic Thinking and Cognition*

According to Bonn (2005), the individual strategic thinker builds mental representations that direct their decisions, and in our literature review, cognitive maps were identified as a tool utilized by effective strategic thinkers. Fiol & Huff (1992) argue addressing the strategic concerns of managers requires the use of different cognitive maps, and that an emphasis towards strategic thinking drives the need for maps that may be modified due to a decision's context. Saloner et. al. (2001) also propose that strategic thinkers develop cognitive maps to enhance to relate different aspects of their organization. An individual's cognitive ability is also linked to strategic thinking and decision-making ability, with Frederick (2005) arguing those with higher IQ differ from those of lower intelligence or ability typically have larger working memories, faster reaction times and greater susceptibility to visual illusions. Whilst Olson & Simerson (2015) deemphasize the role of intelligence in strategic thinking and consider cognitive ability to be correlated with creativity, namely an ability to take risks, comfort in uncertainty and ambiguity and an ability to recognize related concepts and principles (Olson & Simerson, 2015 p. 6).

### *Background and Experience*

The multidimensional nature of strategic thinking means its influence transcends the core concepts, characteristics, and traits we have identified so far, and is also dependent upon an individual's background, level of work experience, and exposure to certain environments experienced within an organisation. Dragoni et. al. (2011) link cognitive ability to experience and exposure, proposing that prior research demonstrates cognitive ability: a person's general intelligence is intrinsically linked to leader emergence and effectiveness, with their own recent study enforcing the belief that accumulated work experience correlates positively to an executive's strategic thinking competency within particular working

parameters. Dragoni et. al. (2011) further argue that extraversion and openness are characteristics that contribute to work experience accumulation and perhaps even cognitive ability. The extroverted individuals who demonstrate a high degree of openness as being more predisposed to accumulate relevant work experience and hence improve their cognitive thinking ability through being environmental exposure.

Bowman (2016) highlights the importance of asking questions as a means of improving one’s strategic thinking abilities, indicative of a belief that this ability can be improved, refined and developed through practice. Easterby-Smith & Davies (1983) argue that it is possible to refine and develop strategic thinking ability at least within an organization, with their focus being on managers and executives. The authors scrutinize contemporary training methods particularly lectures as having limited ability in improving strategic development and thinking, whilst showing particular preference towards more modern methods for strategic development, including simulations, games, and action learning (Easterby-Smith & Davies, 1983), and natural learning as potential tools for improving one’s strategic thinking ability.

Figure 3 below demonstrates the multidisciplinary, multi-dimensional approach to strategic thinking we have identified from our literature review. Strategic thinking transcends the scope of management and organisational research, and is studied in psychological journals and in cross-collaborative works. Management journals typically focus upon the organisational implications, and psychology upon the cognitive focus, although again there is some crossover. Both schools of thought examine the effects to the individual and the group or organisation, and discuss the role and impact of background experience and exposure.

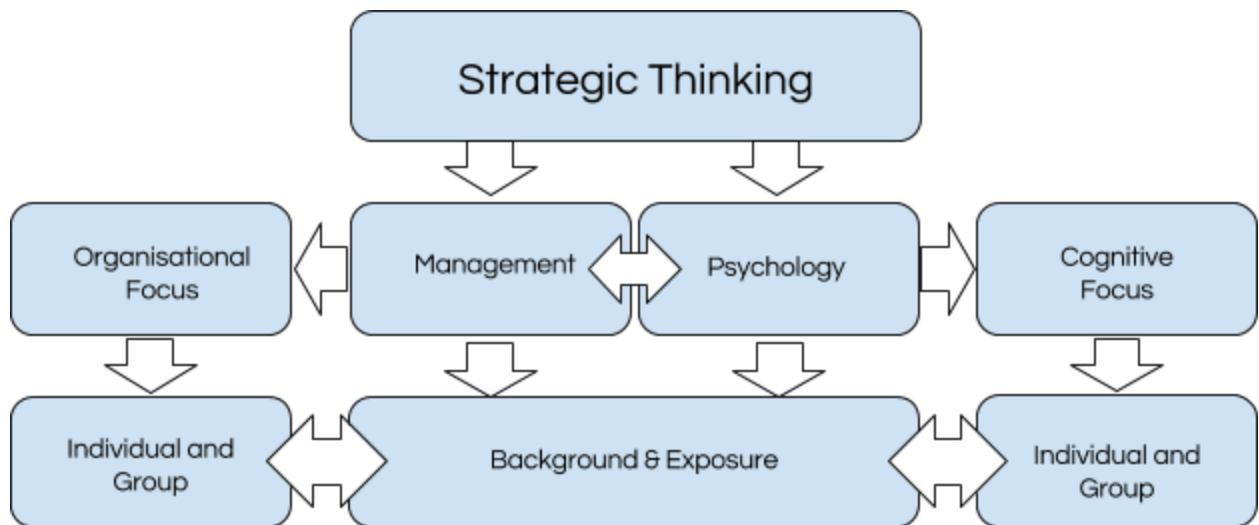


Figure 3: Strategic Thinking a Multidisciplinary, Multidimensional Approach.

### *Finalizing Strategic thinking*

Strategic thinking concerns “thinking in a novel way” (Steptoe-Warren et al., 2011 p. 239) and is an “ongoing and intertwined” thought process (Bonn, 2005 p. 337). It is a “way of solving strategic problems” (Bonn, 2005 p. 337) by imagining new and very different potential futures of the organization (Gratz, 2002 & Heracleous, 1998). “The purpose of strategic thinking is to discover novel, imaginative strategies” (Heracleous, 1998 p. 485) and its outcome is an integrated perspective of the organisation (Mintzberg, 1994a, b). It is like constructing a mental road map that takes you from source to destination and connects the past, present, and future (Olson & Simerson, 2015). Therefore, strategic thinking is about contemplating the future of the organization by taking into account all the potential future scenarios which may or may not be significantly different from the past and the present.

### **3.3 The Core Concepts of Strategic Thinking**

Our literature review examines the multidisciplinary and multidimensional facets of strategic thinking and has allowed us to identify a number of core concepts that multiple sources agree to be evidential of the ability to think strategically. The 15 concepts of strategic thinking we reached consensus on are displayed in figure 3 below:



Figure 4: 15 Core Concepts of Strategic Thinking: Identified in our literature review

#### *Definitions of the 15 Core Concepts: Based on themes identified in the literature*

There are wider and differing interpretations within different texts of course to the definitions of the core concepts identified. These definitions however are intended to provide the reader with a brief, and generalised reference point:

1. **Analytical** - Demonstrating a logical, reason-based approach
2. **Creative** - Searching for new approaches and envisioning better way of doing things (Bonn, 2005, p. 338)
3. **Conceptual** - Forming ideas or concepts to provide answers to experiences, observations etc.
4. **Context Oriented** - The ability to recognize the environment of operation (e.g. individual, organisational) (Bonn, 2005)
5. **Divergent** - The ability to think in a different manner or ways
6. **Flexible** - Displaying adaptability, able to handle change
7. **Future Oriented** - Being forward thinking
8. **Holistic** - Realisation that a scenario must be viewed as a whole, rather than within separate parts (Kaufman, 1991)
9. **Integrative** - The ability to combine concepts, thoughts, or ideas
10. **Intuitive** - The ability to react instinctively (Olson & Simerson, 2015)
11. **Process Oriented** - Cognitive activities demonstrative of self-awareness, and awareness of the wider environment (Olson & Simerson, 2015)
12. **Reflective** - An ability to draw upon and learn from past experiences
13. **Synthetic** - Refers to the ability to synthesize (blend) ideas, information, or processes
14. **Systematic** - An ability to examine how different concerns are connected, affect, and influence one another (Liedtka, 1998)
15. **Visionary** - Individuals who convey a sense of direction, and provide a focus for all activities in an organisational context (Bonn, 2005, p.339)

*Reasoning Behind our Core Concepts of Strategic Thinking*

As discussed earlier, we identified 15 concepts that we wish to examine with participants in our background questionnaire and in-depth interview process. In deciding upon these final 15 themes we considered the validity of the sources themselves, common themes across the literature, and concepts multiple authors highlighted as relevant in effective strategic thinking. An inexhaustive table of these concepts from our literature review is displayed below:

<b>Analytical</b>	<b>Conceptual</b>	<b>Context Oriented</b>	<b>Creativity</b>	<b>Divergent Thinking</b>	<b>Flexibility</b>	<b>Future Oriented</b>	<b>Holistic</b>
Allio (2006)	Andrews (1971)	Bonn (2001), (2005)	Bonn (2001),(2005)	Bonn (2001), (2005)	Fiol & Huff (1992)	Allio (2006)	Bonn (2001), (2005)
Andrews (1971), (1980)	Kim & Mauborne (2005)	Liedtka (1998), (2011)	Graetz (2002)	Chevallier (1974)	Hitt et. al. (2001)	Bonn, (2001), (2005)	Kaufman (1991)
Bourgeois & Eisenhardt (1988)	Nuntamanop et. al. (2013)	Linkow (1999)	Heracleous (1998)	Heracleous (1998)	Nuntamanop et. al. (2013)	Hamel & Prahalad (1994)	Liedtka (1998)

Hussey (2001)	Saloner et. al. (2001)	Olson & Simerson (2015)	Hussey (2001)	Schoemaker et. al. (2013)	Rowe et. al. (1986)	Linkow (1999)
Nuntamanop et. al. (2013)	Thompson & Strickland (1996)		Liedtka (1998), (2011)		Steptoe-Warren et. al. (2011)	
Olson & Simerson (2015)			Mintzberg (1994a, b)			
Thompson & Strickland (1996)			Nuntamanop et. al. (2013)			
			Olson & Simerson (2015)			
			Rowe et. al. (1986)			

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<b>Intuitive</b>	<b>Integrative</b>	<b>Process Oriented</b>	<b>Reflective</b>	<b>Synthesizing</b>	<b>Systemic</b>	<b>Visionary</b>
Graetz (2002)	Bonn (2001), (2005)	Bonn (2001), (2005)	Argyris (2002)	Bonn (2001), (2005)	Bonn (2001), (2005)	Bonn (2001), (2005)
Liedtka (1998), (2011)	Liedtka (1998)	Hampden-Turner (1993)	Bonn (2001), (2005)	Bowman (2016)	Crawford (2013)	Dragoni et. al. (2011)
Mintzberg (1994a, b)	Kaufman (1991)	Liedtka (1998), (2011)	Bowman (2016)	Hampden-Turner (1993)	Liedtka (1998), (2011)	Liedtka (1998), (2011)
Nuntamanop et. al. (2013)	Mintzberg (1994a, b)	Olson & Simerson (2015)	Frederick (2005)	Liedtka (1998), (2011)	Olson & Simerson (2015)	Mintzberg (1994a, b)
Olson & Simerson (2015)			Schoemaker et. al. (2013)			Nuntamanop et. al. (2013)
						Rowe et. al. (1986)
						Thompson & Strickland (1996)

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Table 3: Sources Supporting the Core Concepts

### 3.4 A Model of Strategic Thinking

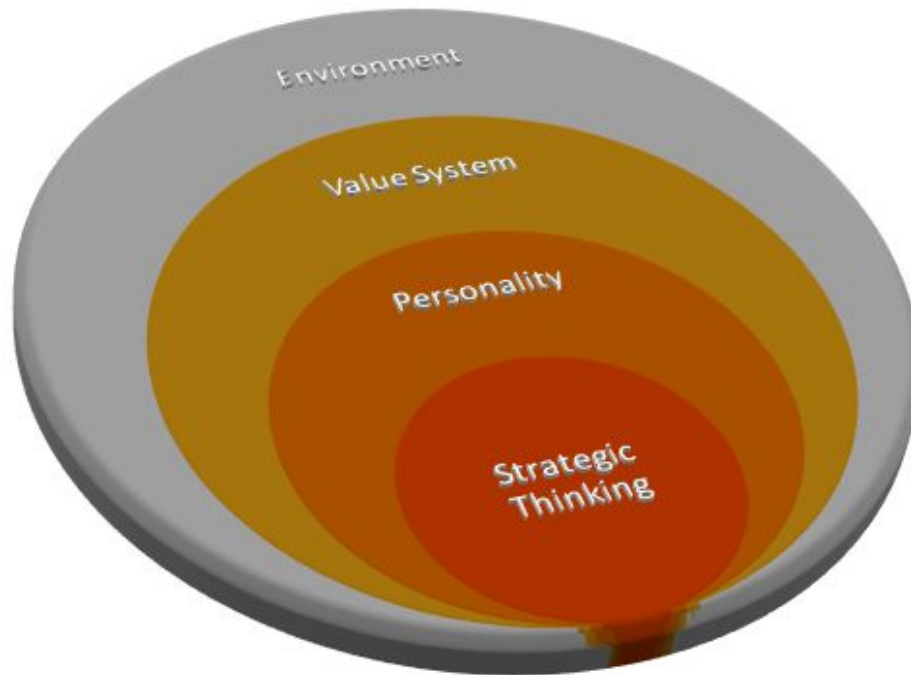


Figure 5: An Expanded Approach to Strategic Thinking

We humans think in different and certain ways. This happens because there are particular factors that impact or give rise to the way we think and how we see the world. In line with the thinking of Maretha Prinsloo (Cognadev Technical Manual, 2016), we believe that the environment, value system and the personality of an individual are the three factors or the three outer rings (figure 5), that influence our cognitive preferences and therefore our strategic thinking ability. By environment, we mean the surroundings where an individual has resided, or is born and brought up in etc. and the different kinds of experiences he/she has been subjected to. Maretha Prinsloo refers to environment factor as exposure (Cognadev Technical Manual, 2016). Now, environment clearly has an impact on any individual which shapes their value system referring here to a set of rules or rule of thumb that explains or decides what is right and what is wrong for any individual. These two factors together, combined with the unique personalities of individuals (such as being creative, analytical, reflective, action-oriented, etc.) directly influence the way we think, and therefore why we do, and why we do not think in a strategic way. If we can test this model fully (current research is doing it in a partial way), it may have wider implications because then we will be able to identify what kind of environments, value systems, and personalities are favourable for thinking in a strategic way, and if any individual or organization wants to improve their strategic thinking they will know what to do to achieve this.

## *Chapter Summary*

Our literature review has focussed upon the multidisciplinary and multidimensional scope of strategic thinking, where management and psychological approaches must be considered, alongside aspects of strategic thinking that are applicable to both the individual and the group or organisation. In determining our 15 core concepts of strategic thinking, we examined core themes evident throughout the literature where multiple credible sources found agreement, whilst also examining the different schools of thought within strategic thinking where the sources have contrasting views. We focus on the role of cognitive ability and psychology, background, experience, and exposure to address aspects of the literature that enable us to identify different perspectives and to assist us in addressing our research questions. Lastly, we draw upon our knowledge base to examine our own expanded approach to strategic thinking.

## 4. Cognitive Process Profiling (CPP)

### 4.1 What is Cognitive Process Profiling (CPP)

Cognitive Process Profiling (CPP) was developed by Dr. Maretha Prinsloo, Director of Cognadev Ltd (Cognadev Technical Manual, 2016). CPP is an online problem-solving assessment, that the user takes in a monitored, unfamiliar environment, and measures the user's behaviour through their actions by means of an advanced mouse tracking capability. Cognadev state the CPP assessment is designed to measure a person's intellectual constructs inclusive of:

- Judgement and decision-making
- Strategizing
- Generalist versus specialist orientation
- Creativity
- Complexity
- Preferences
- Other thinking and problem-solving factors related to professional, managerial and executive functioning.

(Cognadev Technical Manual, 2016, p. 8).

#### *Theoretical Model Behind Cognitive Process Profiling*

Cognadev identifies the assessment itself as being based upon a number of theoretical models which are integrated to explain cognitive functioning in the workplace environment (Cognadev Technical Manual, p. 11). The integrated model is called the Cognadev Information processing model and consists of metacognitive and performance processes (Cognadev Technical Manual, 2016, p 25). Memory, exploration, analysis, structuring, and transformation are identified as performance processes whereas metacognition is referred to as a metacognitive process (Cognadev Technical Manual, 2016, p. 24). The complete thought process behind CPP is that “a person uses memory as the basis of problem-solving and then explores, analyses, structures and then transforms that information into a solution” (Cognadev Technical Manual, 2016, p 26). Metacognition (self-awareness) guides the application of performance processes and involves asking task-relevant questions related to coherence, clarity, accuracy etc. to guide their thinking (Cognadev Technical Manual, 2016, p. 24). However, the complete thinking process is a highly integrated and nonlinear process and doesn't follow any strict hierarchy (Cognadev Technical Manual, 2016, p. 24).



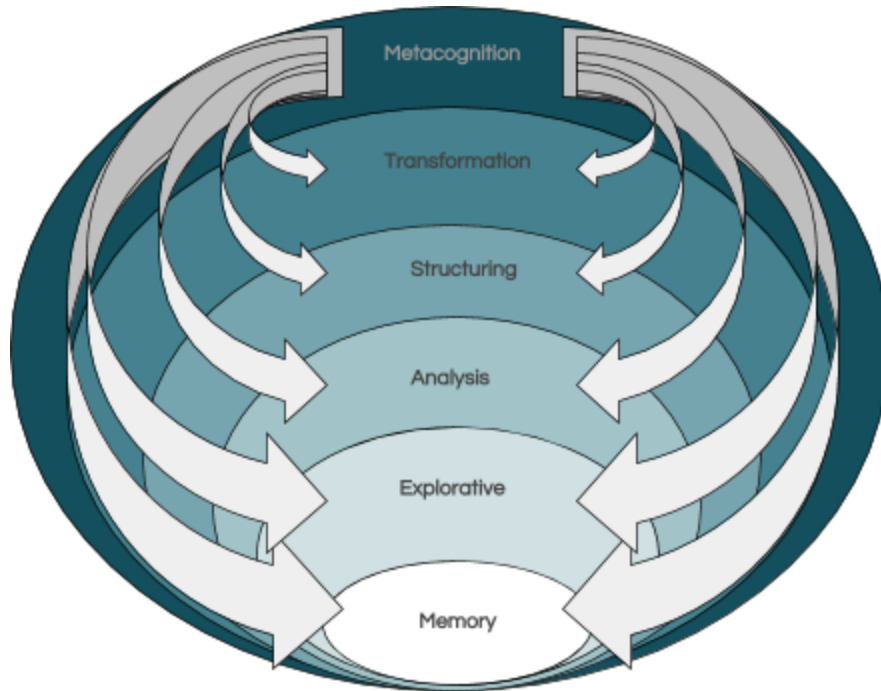


Figure 6: Based upon Cognadev Information Processing Model: Metacognitive criteria that guides thinking processes. (Cognadev Technical Manual, 2016). As is displayed above metacognitive processes drive the self-awareness and application of each of the following performance processes (Cognadev Technical Manual, 2016).

*Suitable Work Environments*

Prinsloo’s Cognadev Information Processing model discussed above (Cognadev Technical Manual, 2016) draws upon the work of noted psychologist Elliott Jaques’, most notably Stratified Systems Theory (SST) which argues that different cognitive states exist, and individuals change and reach different states as their cognitive power develops (Jaques, 1986). This potential increase with time and relates to an individual reaching time-horizons in their own development through evaluating work complexity according to time-frames (Jaques, 1986). Prinsloo, however, believes with cognitive power the emphasis should be on an individual’s potential and exposure (Cognadev Technical Manual, 2016). This is reflected in the CPP assessment, which measures instead an individual’s complexity preferences and capabilities through considering the elements an individual keeps in mind simultaneously, the interactivity of these elements and the abstract ability accommodated (Cognadev Technical Manual, 2016, p.11). Whilst the theory of Jaques (1986) identifies seven levels of task complexity in a work environment, Prinsloo has refined this to five broad categories of work outlined below:



Figure 7: The Five Individual Work Environments Identified in the CPP Assessment

1. **Pure Operational:** Individuals who show less interest in intellectual complexity, vagueness and cognitive challenge.
2. **Diagnostic:** Individuals can be quite analytical, but still show a need for structure in the form of technical guidelines and/or previous experience.
3. **Tactical Strategy:** Individuals who no longer rely on linear processing, but prefer viewing issues in terms of tangible systems and the interaction between observable system elements.
4. **Parallel Processing:** Individuals with the capacity to accommodate novelty, vagueness, dissonance, and fragmentation, all of which require the cognitive skills of integration and innovation.
5. **Pure Strategy:** An individual's functioning is characterised by a strong intuitive and holistic "big picture" inclination.

Source: Prinsloo, M. (2017). The CPP Levels of Work: Their Relationship with Actual Job Complexity

Prinsloo's reasoning is that there are two opposing domains in the world of work - the operational side and the strategic, which provides the dimension for the five work environments outlined (Cognadev Technical Manual, 2016). As you move from operational to strategic, there is increasing uncertainty and complexity, necessitating an outlook that looks at possibilities over practicalities, awareness of situational dynamics, and a need for long-term orientation and therefore strategic thinking as outlined below (Cognadev Technical Manual, 2016, p.12). Upon receipt of assessment results, an individual receives feedback on how they apply six processes - memory, exploration, analysis, integration, transformation, and metacognition at their current and potential work environment level (Cognadev Technical Manual, 2016). For example, an individual's preferred current work environment may be Diagnostic Accumulation (level 2), and their potential work environment may be Tactical Strategy (level 3). An individual may also have a preferred current work environment of Diagnostic Accumulation, and a potential work environment of Parallel Processing (level 4). The latter example is particularly prevalent amongst executives who work in a diagnostic environment where their potential may be being suppressed by their field or area of work, as they may work in an environment with a focus towards getting things done or completing tasks swiftly. Whilst your potential work environment may be the same as your preferred current work environment, it is not possible to regress (Cognadev Technical Manual, 2016). Strategic thinking ability is enhanced as an individual progress towards Pure Strategy (level 5). We will be referring to the work environments by levels 1-5 frequently in our findings and analysis to help clarify the results of our research.

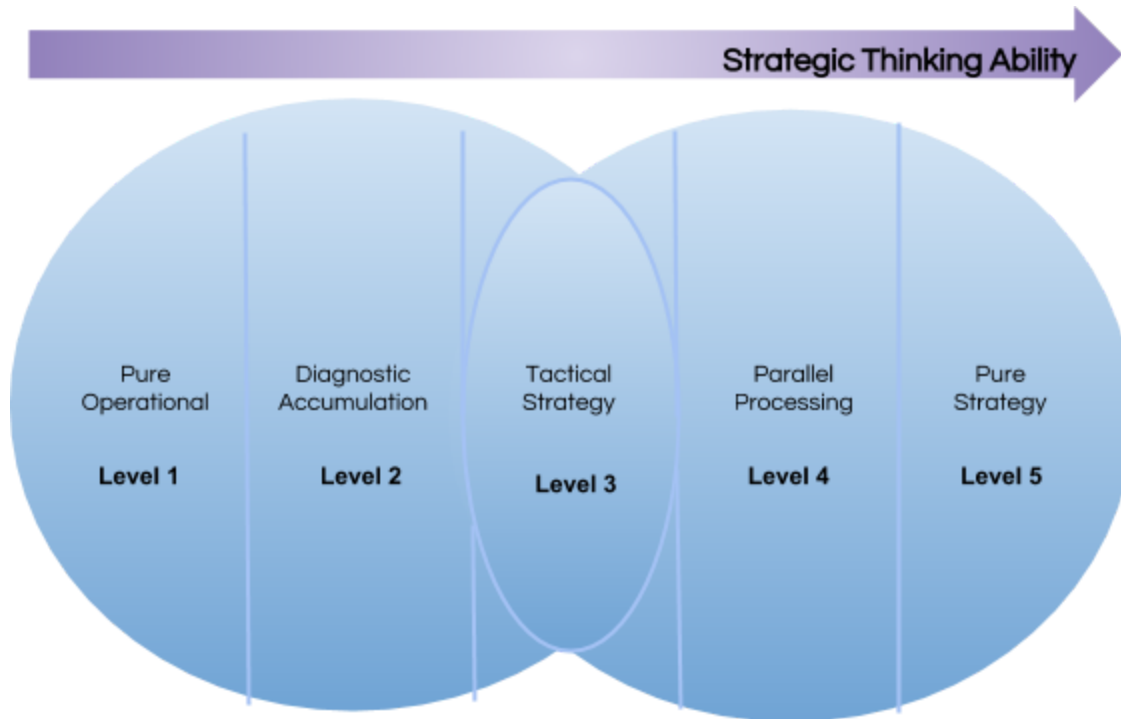


Figure 8: Displays the complexity of work, according to incremental levels (1-5). Incremental levels are displayed as an orientation towards strategic thinking. Based upon Figure 2: The Complexity of Work (Cognadev Technical Manual, 2016, p.12).

### *An Important Note on Work Environments*

Whilst the focus of our study concentrates particularly upon the merits of the ‘pure strategic’ work environment and the parallels that are drawn between this environment and the literary definition of strategic thinking we identify, we believe it is important to emphasize that one work environment is in no way superior to another, and rather reflects the user’s orientation towards the operation or strategic, be that structured or chaos, detailed or dynamic thinking, certainty or uncertainty (Cognadev Technical Manual, 2016).

### *Cognitive Styles*

The CPP assessment is able to identify and measure an individual’s cognitive styles. Cognitive styles are the response tendencies an individual use when dealing with unfamiliar information, such as in the assessment itself, and it is deemed highly likely the individual will display the same stylistic preferences in familiar contexts as well (Cognadev Technical Manual, p. 20). For example, an individual who values accuracy is likely to demonstrate an analytical approach to problem-solving (Cognadev Standard Report, 2017, p. 12). In the report, each individual’s preferred styles are outlined (those used most prominently) with a description and implications, and those that are underutilized (if any) (Cognadev Technical Manual, 2016). The assessment also summarizes the order (ranked 1-14) that an individual applies all the cognitive styles in. It is important to note that cognitive styles have names that are indicative of their abilities, and do not directly translate to typical definitions. For example, the reflective style is typically associated with strategic thinking, and recommended as an area of focus for managers in the literature to assess their own capability, whilst in the context of its use as a cognitive style, reflection here refers to a tendency to avoid making mistakes as a need for certainty (Cognadev Technical Manual, 2016).

### Cognitive Styles and their Orientation (Operational, Mixed, or Strategic focussed)

<p><b>Structured Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Likes to group information into coherent categories or structures</li> <li><input type="checkbox"/> May represent information as pictures, maps, and diagrams</li> <li><input type="checkbox"/> Likely to have an operational or tangible focus</li> </ul>	<p><b>Reactive (Impulsive) Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Likely to work quickly but inaccurately</li> <li><input type="checkbox"/> May respond emotionally rather than rationally</li> <li><input type="checkbox"/> May find it difficult to deal with unfamiliar cognitive challenges</li> </ul>
<p><b>Explorative Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tends to investigate issues</li> <li><input type="checkbox"/> Tries to understand the task requirements</li> <li><input type="checkbox"/> May get confused by over-exploring and checking too much</li> </ul>	<p><b>Reflective Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tends to explore and consider information very carefully</li> <li><input type="checkbox"/> Tries to avoid making mistakes</li> <li><input type="checkbox"/> Shows a need for certainty</li> </ul>
<p><b>Trial-and-Error (Random) Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Has a vague unsystematic approach to problem solving</li> <li><input type="checkbox"/> May show an undirected action approach</li> <li><input type="checkbox"/> May not systematically analyse, structure or reason about issues</li> </ul>	<p><b>Quick Insight Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Grasps ideas and reaches conclusions relatively quickly</li> <li><input type="checkbox"/> Processes and integrates information relatively quickly</li> <li><input type="checkbox"/> May be sensitive, intuitive, and trusts own insights</li> </ul>
<p><b>Metaphoric Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tends to view problems abstractly or symbolically</li> <li><input type="checkbox"/> Often creates mental pictures to represent an idea</li> <li><input type="checkbox"/> May use storytelling techniques, vivid verbal pictures, analogies, and metaphors</li> </ul>	<p><b>Analytical Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Has a precise, detailed approach</li> <li><input type="checkbox"/> Enjoys pulling information apart and subdividing issues</li> <li><input type="checkbox"/> Identifies relationships between different elements</li> </ul>
<p><b>Learning Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tends to be curious and explorative</li> <li><input type="checkbox"/> Is adaptable, flexible and able to acquire new ways of thinking</li> <li><input type="checkbox"/> Can easily get bored, so needs challenge and stimulation</li> </ul>	<p><b>Memory Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tends to concentrate well and remembers information</li> <li><input type="checkbox"/> Relies on past experience and a knowledge base</li> <li><input type="checkbox"/> Can overload memory and become confused</li> </ul>
<p><b>Logical Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tends to look for logical evidence</li> <li><input type="checkbox"/> May apply convergent or divergent reasoning</li> <li><input type="checkbox"/> May focus on detail in an analytical manner</li> </ul>	<p><b>Holistic Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tends to see the big picture without losing sight of detail</li> <li><input type="checkbox"/> Wants to contextualize information and tends to ask “why?”</li> <li><input type="checkbox"/> May be aware of detail but may not focus on it or analyse it to any great extent</li> </ul>
<p><b>Intuitive Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Usually explores and checks information in a seemingly aimless manner</li> <li><input type="checkbox"/> Largely relies on connections made at a subconscious level</li> <li><input type="checkbox"/> May integrate information to formulate creative and unusual ideas</li> </ul>	<p><b>Integrative Style</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tends to make sense of information as they go along</li> <li><input type="checkbox"/> Likes the challenge of reconciling discrepant, ambiguous and fragmented elements to create a coherent whole</li> <li><input type="checkbox"/> Tends to focus on complex information and intellectual challenges</li> </ul>

Table 4: Cognitive Styles Proposed in the CPP Assessment Source: Congadev Technical Manual, p. 20-23). Cognitive styles with a light red background have a more operational leaning, a light orange background indicates an operational and strategic (mixed) leaning, and light green indicates a more strategic leaning. Quick insight (light blue) is unique and categorized as neither operational or strategic by Cognadev.

The cognitive styles identified above may be operational focused or strategic focussed, meaning certain styles are associated with heightened strategic thinking ability, whilst other styles combine operational and strategic aspects. For example, the holistic style where emphasis placed on the big picture, and the intuitive style where the individual is heavily reliant on connections made at a subconscious level and demonstrates an ability to formulate creative ideas are strategic cognitive styles (Cognadev Technical Manual, 2016). Conversely, the explorative style, where an individual focus upon understanding a task's requirements and over-checking details, and the reflective style, where the individual tries to avoid making mistakes and displays a need for certainty are operational focused. It is notable that in the context of cognitive styles the terminology is markedly different to what Cognadev refer to as the 'laymans' terms of the title word (Cognadev Technical Manual, 2016). Lastly, it is noted that cognitive styles can have operational and strategic tendencies, for example, the memory style, where concentration and integration is demonstrative of strategic ability, whilst the risk of memory overload, steers this style away from being strategic (Cognadev Technical Manual, 2016).

### **Information Processing Competencies**

The metacognitive and the performance processes from the Cognadev Information processing model are broken down into 14 concepts called Information Processing Competencies. Cognadev considers Information Processing Competencies to be the purest constructs of CPP, as they are the underlying competencies behind the metacognitive and performance processes (Cognadev Technical Manual, 2016). The competencies are oriented towards the strategic or the operational and some combine both aspects (Cognadev Technical Manual, 2016). For example, Integration, Complexity, Logical reasoning, verbal conceptualization, Judgement and Quick Insight Learning facilitates Strategic Thinking. Figure 9 demonstrates the information processing competencies and their relationship to metacognitive and performance processes.

Processing Competency		Description
Memory	Use of memory	Tendency to rely on memory and to concentrate on the task
	Memory Strategies	Effectiveness of memory strategies
Exploration	Pragmatic	Practical orientation. Determining relevance in structured contexts
	Exploration	Effectiveness, depth and width of exploration
Analysis	Analysis	Working systematically. Detailed and precise in differentiating and linking elements
	Rules	A focus on rules
Structuring/ Integration	Categorisation	Creating external order, categories and reminders. Structuring tangibles
	Integration	Synthesis of ambiguous / discrepant / fragmented information
	Complexity	Preferred level of complexity and unit of information used
Transformation	Logical Reasoning	Disciplined, logical following through of reasoning processes
	Verbal Conceptualisation	Unusual / flowery / creative / and / or abstract verbalisation and conceptualisation
Metacognition	Judgment	Capitalizing on intuitive insights to clarify unstructured and vague information
	Quick Insight Learning	Tendency to grasp new concepts and acquire knowledge relatively quickly
	Gradual Improvement Learning	Preference for practical or experiential learning

Figure 9: Information Processing Competencies: Processing or Metacognitive Competency and a brief description are displayed above. Abridged from Cognadev Standard Report, 2016, p. 16.

## 4.2 Background & Context: Why we are using the CPP Assessment in our Study

As identified through our research questions, it is the concept of identifying strategic thinkers and examining whether this ability can be measured that is of particular interest to us. The ability to pinpoint individuals who are particularly adept at thinking strategically and those who have growth potential to do so will have profoundly beneficial implications to organizational prosperity and longevity; and will greatly benefit the individuals by allowing them to examine their own strategic thinking ability, and help them to identify what areas they currently excel at, and where they can look to improve and develop upon. We believe that Cognitive Process Profiling (CPP) offers a means of progression towards bridging this current knowledge gap and lack of strategic thinking awareness, by offering a potential method of assessing this ability.

Our research indicates that the CPP assessment is able to effectively measure many of the competencies and concepts of strategic thinking we have identified through our literature review. A prominent example being the assessment's ability to examine conceptual and creative concepts through information processing competencies such as verbal conceptualisation, abstraction, creative and conceptual reasoning.

These concepts, in particular, abstracting, creativity, and conceptualising are prominent in the literature across many sources we examined including in Mintzberg (1994a, b), Linkow (1999), Bonn (2001, 2005), Olson & Simerson (2015). Another, the ability to examine vision and intuition, the two of our core concepts of strategic thinking. Individuals with purely strategic tendencies are identified as learning through a ‘philosophical and visionary inclination capitalising on intuition (Cognadev Technical Manual, p. 19). Being visionary is argued to be fundamental to strategic thinking by Bonn (2001, 2005), Liedtka (1998, 2011), & Mintzberg (1994a, b) and use of intuition by Graetz (2002), Liedtka (1998, 2011) and Mintzberg (1994a, b) amongst others readily cited in the field.

A major concern for executives that Bonn (2001) remarks upon regards working in strategic rather than operational terms, is directly addressed by the CPP assessment through identification of the best suited work environment based on how an individual currently applies their cognitive competencies, and the work environment they have the potential for (Cognadev Technical Manual, 2016, p. 12). Mintzberg and Hanford (cited in Nuntamanop et. al. 2013) both examine the differences between strategic and operational thinking, including thought processes such as long-term and short-term thinking, conceptual versus concrete thinking and breaking new ground versus routine and ongoing matters (Nuntamanop et. al., 2013, p. 246). The CPP assessment is able to implement a strategic and operational orientation scale that provides the user with feedback on these processes through their performance. The assessment examines the user’s short and long term focus, based on the principle that the short-term orientation changes to long-term orientation as strategic thinking ability improves (Cognadev Technical Manual, 2016, p. 12). The user gains insight on their conceptual and concrete thinking through their prevalence or dealing with intangible conceptual information, or tangible concrete information, and examining the user’s preference for unstructured, non-routine information, and structured routine information (Cognadev Technical Manual, 2016).

In summary, those identified as purely strategic through the CPP assessment directly exhibit multiple competencies of what strategic thinking ability is, namely they are creative, seeing a long-term vision of the future, making frequent use of their own intuition, and show a preference for abstract, conceptual, and complex information sources amongst others.

### **4.3 Format of the CPP Assessment**

The CPP assessment is a unique computerised simulation exercise that is easy for users to administer and provides clear feedback to the individual assessed (Cognadev Technical Manual, p.8). The development of the assessment method was inspired by an observed card game, and in the 90s was transformed into a computer-based assessment before undergoing refinement and validation through quantitative and qualitative means (Cognadev Technical Manual, p. 10). In its current format, the users are tasked with compiling a total of eight stories by interpreting the message that is conveyed by the symbols on the cards; which are also supposed to be manipulated on the screen through the use of the mouse (Cognadev Technical Manual, 2016, p.8). Once the participant has decided upon their final interpretation of the story, they select the ‘end’ option and type in the keypad their own customized answer in sentence structure as a response (Cognadev Technical Manual, 2016). These eight short stories or messages become increasingly complex as the user progresses and includes more vague information (Cognadev Technical Manual, p. 9).

In terms of function, the inbuilt engine of the CPP test measures both the person's movements and the stories that they create (Cognadev Technical Manual, p. 9). This is based on a highly advanced and interactive mouse tracking process, whereby the assessment is able to externalise and track micro thinking according to thousands of measurement points (Cognadev Technical Manual, p.8). Cognadev holds the licence for the assessment itself and its distribution, and provide a full report and results for each individual participant's assessment. The results are distributed by the licenced facilitator who must be present (either in-person or through video presence), so that the facilitator is able to interpret each user's results in detail and provide feedback and guidance to the user, to ensure that he/she is able to gain a thorough understanding of their results from their own, personalized report.

#### **4.4 CPP Results and Reports**

The CPP Assessment provides us with a comprehensive report on each user, detailing the results of their assessment, and focussing on the cognitive constructs that the assessment itself analyses and measures. The user is able to identify their current work environment and potential work environment (from Pure Operational to Pure Strategy) and receive results and detailed analysis relating to their cognitive style preferences and capabilities, and their information processing competencies (Cognadev Standard Report, 2017 p. 2). A detailed account of the results and report process in terms of relevance to our research is found below:

##### **Current and Potential Work Environments**

To recap on our discussion in section 4.1, the user is provided with a current suitable work environment, and a potential work environment across the five work levels identified based upon their cognitive profile, from Pure Operational, Diagnostic Accumulation, Tactical Strategy, Parallel Processing, and Pure Strategy (Cognadev Technical Manual, 2016). Progress throughout the assessment is tracked, and a graphical representation of the users current and potential work environment is displayed in the report, demonstrating how far they have advanced in their current work environment, and how far they can progress into their potential work environment. In our study, this provides us with the opportunity to compare and contrast all participants scores and go into further depth with those oriented towards Pure Operational and Pure Strategy, and those who are selected for in-depth interviews, to gain a greater perspective on their individual orientations.

##### **Cognitive Styles**

As we discuss in section 4.1, there are 14 cognitive styles, which are ranked for the user in the report, from the order of most utilized and the least utilized in the results, with a breakdown of the aspects of the user's most utilized cognitive styles in more detail for better understanding. With certain cognitive styles being strategic focused, operational focused and others combining aspects of both orientations. In terms of our own study, these styles are useful to allow us to examine the styles that are most and least prevalent across participants, and to compare and contrast the styles utilized by those who lean more towards an



operational work environment, and those who lean more towards a strategic work environment, and across many other variables.

### **Information Processing Competencies**

The metacognitive and the performance processes from the Cognadev Information processing model are broken down into 14 concepts called Information Processing Competencies. The report displays how proficient an individual is across these 14 competencies, with a percent based result (out of 100). These competencies are oriented towards the strategic or the operational and some combine both aspects (Cognadev Technical Manual, 2016). In terms of our own study, these competencies are useful to compare them directly with the background and in-depth interview scores to see their relationships and how they relate individually with them.

### ***Chapter Summary***

This chapter provided an in-depth account of what the Cognitive Process Profiling (CPP) assessment is and its relevance to our research. An overview of the theoretical model that is instrumental to the construct of the assessment is outlined, and explanations of the current and potential work environments identified by the assessment, along with the relevance of Cognitive Styles, and Information Processing Competencies. We then discuss why CPP is relevant to our study, before outlining the format and procedure of the assessment, followed by the results and reports process from the CPP assessment.

## 5. Findings & Analysis

### 5.1 Participant Background Questionnaire:

The participant background questionnaire was conducted via Google forms to delve a bit deeper into each candidate's background, preferences, to provide a preliminary overview of their own interpretation of what strategic thinking is, and to examine the link between strategic thinking in the literature and the CPP assessment by comparing their results. The insights generated from the participant background questionnaire are discussed below:

#### *Background & Overview*

**Current position:** Our research involved 40 participants in total, 26 students and 14 managers. However, only 39 completed the CPP assessment.

**Age of Participants:** Participants ranged from 22 years old to 46 years old. With the majority of participants being in their 20s or 30s.

**Gender of Participants:** 18 female and 22 male participants took part in the study (45%/55%).

#### **Nationality of Participants:**

Even though assessment sessions were conducted within Sweden (Lund/Stockholm), our study benefited from an international mix of individuals. The majority of participants 19 (47.5%) originated from Sweden, 3 from Iceland, and 3 from Turkey, with all remaining nationalities having 1 representative from Belgium, Brazil, Bulgaria, Egypt, Greece, Hungary, Italy, Macedonia, Myanmar, Pakistan, Poland, Romania, Syria, Thailand, and the United Kingdom.

#### **Educational Background of Participants:**

Of the 40 participants, 15 stated that they had completed a Bachelor's degree in Engineering. Considering science and non-science backgrounds on bachelor degree programs, 18 participants had a relevant bachelor's degree in science, and 22 participants had bachelor's degrees from other fields. When it came to Masters Programmes, a fair proportion of participants from a managerial or executive background had completed a Technology Management MSc, whilst 23 student participants (57.5%) currently enrolled on the Masters in Management (MiM) programme for the 2016-17 academic year at the Lund University. Other Master's Degrees completed amongst all participants included Entrepreneurial Finance, European Business Law, and Volcanology. It is notable that many participants had completed or were in the process of completing more than one Master's Degree, including those currently deemed students for the purposes of this study.

### **Managerial/Executive Work Experience:**

40% of the participants had 0 years of managerial/executive experience, however, this is taking into consideration student participants, the majority of whom have 0 years of experience. 32.5% of participants had 0-2 years of experience, whilst 12.5% had 3-5 years and 15% over 5 years of experience. It is relevant to note that whilst the majority of participants had some form of work-based experience, however in terms of management or executive experience, the majority of students (61.5%) have no formal experience at present, whereas vast majority of managers/executives had a few years of experience with 6 (42.5%) having over 5 years (refer Appendix D).

### *Participant Background Questionnaire Results*

In total, 40 respondents completed the background questionnaire. The questionnaire was scored by a pre-coded points-based system out of a total possible score of 13. In terms of the distribution of results, two managers and one student scored the highest on the background questionnaire with 12 points out of a possible 13. One student scored the lowest with 5 points, and then one manager scored the next lowest with 6 points.

When comparing average scores between students and managers/executives or engineers and non-engineers through this self-assessment method, no significant difference was found. However, on average managers scored themselves higher than students and engineers higher than non-engineers (Appendix D). In addition, certain patterns evident when comparing the averages of managers/executives and students and those with an engineering/non-engineering background are summarized below:

- ❑ When compared to all questions relating to the core competencies of strategic thinking, managers/executives scored themselves higher than students more frequently
- ❑ When compared to all questions relating to the core competencies of strategic thinking, participants with a background in Engineering scored themselves higher than those with a Non-engineering background on every single question posed
- ❑ Students scored themselves higher on questions relating to reflecting, divergent thinking, and synthesizing, whilst managers/executives scored themselves higher on all other categories on average
- ❑ Managers scored themselves to be considerably more creative than students (Appendix D), and believed themselves to make use of their intuition far more often.
- ❑ Students stated they created visual images of where they wanted to be in the future more frequently, and considered themselves to spend more time reflecting on successful and unsuccessful outcomes (Appendix D)
- ❑ Participants with Engineering backgrounds scored themselves higher across all categories, and they considered themselves to be considerably more analytical than those of a Non-engineering background, far more frequently made use of multiple sources, made use of their intuition more often, and considered themselves to be marginally more creative (Appendix D)

## 5.2 CPP Assessment Analysis

### *A Brief Reminder*

In our analysis of CPP assessment scores, suitable current and potential work environments are referred to terms of levels in the following manner:

Level 1	Level 2	Level 3	Level 4	Level 5
Pure Operational	Diagnostic Accumulation	Tactical Strategy	Parallel Processing	Pure Strategy

Table 5: CPP Work Environment Levels (Cognadev Technical Manual, 2016)

Current and potential work environments are displayed separated by a forward slash '/'. For example, an individual with a current work environment of Tactical Strategy and a potential work environment of Parallel Processing would be displayed as '3/4.'

### *Work Environment Outcomes*

Regarding participants current/potential work environment results, a range of scores was evident. None of those involved in the study were assessed to be currently at level 1 (Pure operational) or level 5 (Pure strategy). 2 participants were assessed to have both a current and potential score of 2/2 indicating Diagnostic accumulation as their current and potential work environment, whereas 3 participants were assessed to have a current and potential of 4/5. Regarding the distribution of other participants, 8 participants were assessed with scores of 2/3, 4 participants with 3/3, 11 participants with 3/4, and 11 participants with a score of 4/4.

When comparing CPP average scores between students and managers/executives, no significant difference was found (3.37/3.28). However, on average participants with engineering background scored slightly higher than non-engineering (3.47/3.24). This indicated to us that having an engineering background and professional work experience may not have an impact on the ability to think strategically.

### *Cognitive styles and preferences*

Three participants (2 students and 1 manager/executive) with a current work environment of Parallel processing (4/4), and a potential work environment of Pure Strategy (4/5) showed a preference for Analytical, Reflective, Logical, Holistic, and Explorative as their most favored style preferences. The next 5 most favoured styles preferred by these participants were the Structured, Learning, Integrative, Intuitive, and Quick Insight styles. The least favored styles identified for these participants were Memory,

Metaphoric, Trial and Error, and Reactive (Appendix C). The most surprising observation was the Intuitive style, as this was supposed to be amongst the most favored styles for strategic thinkers according to both the literature and the Cognadev Technical manual. In our results, the Intuitive style was amongst the least favored style of participants who are on the right side of the spectrum i.e. with strategic thinking orientation.

On the other hand, the two participants (both managers/executives) with a current and potential work environment of Diagnostic Accumulation (2/2) i.e. with least strategic orientation, showed a preference for Trial and Error, Explorative, Structured, Analytical, and Intuitive as their most favoured style preferences. Their next 5 most favoured styles were Reflective, Holistic, Logical, Integrative, and Reactive and the last four being Quick Insight, Memory, Learning, and Metaphoric styles (Appendix C).

### *Information processing competencies*

The data indicated that certain information processing competencies facilitate strategic thinking ability. For example, Memory Strategies, Exploration, Rules, Integration, Complexity, Logical reasoning, Judgement, and Quick Insight Learning competencies facilitates strategic thinking, as participants who were on the right spectrum i.e. with strategic orientation (higher current and potential work environment scores) scored very high than those towards the left of the spectrum i.e. with operational orientation (lower current and potential work environment level scores). When addressing other competencies such as Use of Memory, Pragmatic, Analysis, Categorisation, Verbal Conceptualisation and Gradual improvement learning, participants towards the right of the spectrum also scored higher compared to participants towards the left side of the spectrum, however not to a considerable extent. Line graphs for all information processing competencies are found in Appendix C.

Therefore, results from our analysis were in line with what has been mentioned in Cognadev Technical Manual and it became apparent that many information processing competencies from CPP closely relates to competencies identified in the literature review. For example, competencies such as Analysis, Integration, Complexity, Logical reasoning, Verbal conceptualization, Judgement, Quick Insight Learning all correlate with many of the 15 competencies we have identified from the academic literature (figure 4). However, additional competencies that are identified such as categorization, memory strategies, exploration etc. are different, and do not correlate to the 15 competencies identified in our literature review.

## **5.3 In-Depth Interviews Analysis**

### *Format*

As is outlined in full in the methodology chapter, respondents who were selected to participate in the in-depth interviews were chosen according to specific criteria. The results of the interviews of those 8 students and 6 managers/executives are outlined in Appendix E.

According to the results from the interviews, it was evident that students S1, S7 & S8 scored particularly high compared to student S6 with the lowest score. Taken alone, this would indicate that students who scored the highest should be more proficient at thinking strategically. When we look at managers/executives, a similar pattern could be observed with ME2, ME3, ME5, and ME6 scoring higher than ME1 and ME4. However, one point worth considering here is that there was no significant spread in the results. The range of all scores was from 26 points to 38 points, with no one scoring at either extreme of the points scale. When comparing the average scores of managers/executives (35.33) with students (33.25), or of engineers (33.67) with non-engineers (34.5), no significant difference was found. This indicates that there is no positive or negative effect of an engineering background or professional work experience identifiable in the interview scores.

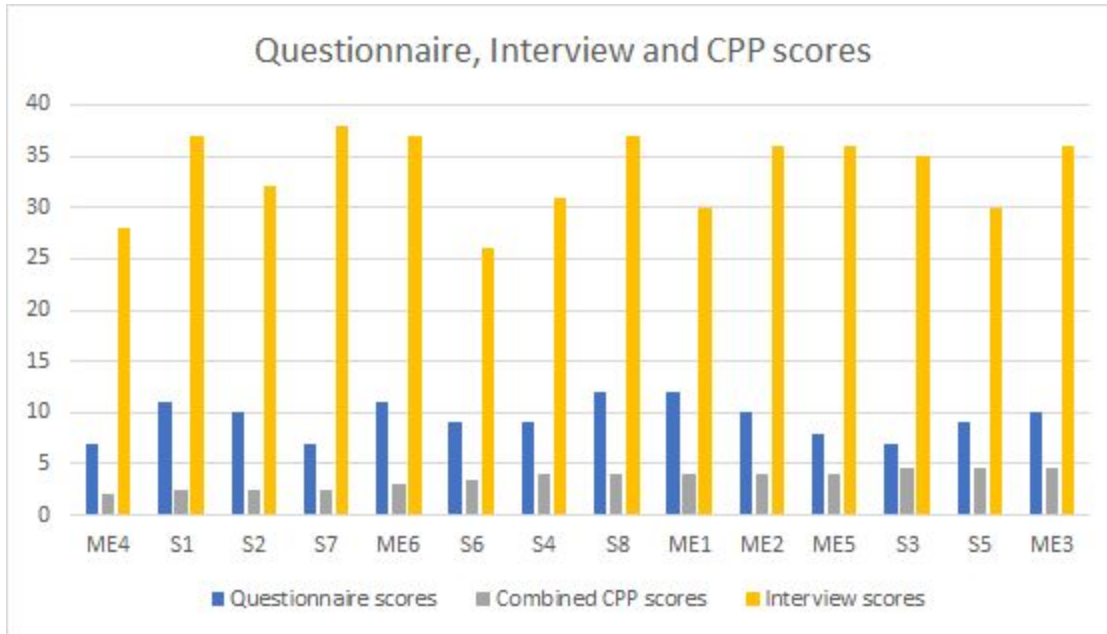
One important observation from the interviews was that some of the students had a difficult time answering, or were unable to answer some of the questions. The reason they frequently highlighted was that they could not relate questions to a work environment context as they lacked any prior work experience, which was understandable as many interview questions were framed with an organizational context in mind. On the other hand, managers/executives did not face any such difficulty. Another observation we remarked upon was that we believed some of the participants were being modest whilst answering certain questions. For example, there were some questions that asked respondents to assess their individual abilities and whilst answering them we suspect certain participants displayed modesty in their responses. We tried to minimize the effects of this problem by asking further relevant questions for clarification. We hypothesized that modesty may be more of a factor with students as we knew each of them individually, whilst the managers we had typically met only briefly on the assessment days.

#### **5.4 Cross-Analysis of the Data**

Following individual analysis of the data collected from the background questionnaire, CPP assessment, and the in-depth interview, our next course of action was to cross-analyse all the data we had collected to identify whether there were any correlations evident that may address our research questions, and to identify areas where no correlations were to be found. To cross analyse, we first combined the current and potential CPP work environment scores into an average score (i.e a score of 3/4 would be read 3.5). The table and graph below outline the results of the 14 students and managers/executives who completed all components (Questionnaire, CPP assessment, and In-depth interviews). The updated questionnaire and interview scores demonstrate the outcome after the omission of 2 and 4 components of questioning from the questionnaire and in-depth interviews respectively. We will return to address these updated scores later in this section.

<b>Student &amp; Managers /Executives</b> <i>(S'x' indicates student and ME'x' indicates Managers/Executives)</i>	<b>Questionnaire Score Full Version</b> <i>(Out of /13)</i>	<b>Updated Questionnaire Score</b> <i>(Omitting Game Theory and Intuition)</i>	<b>CPP Score (Combined Current and Potential Work Environment)</b> <i>(Out of /5)</i>	<b>Interview Score Full Version</b> <i>(Out of /48)</i>	<b>Updated Interview Score</b> <i>(Omitting Experience, Games Theory, Intuition &amp; Systems Thinking,)</i>
<b>S1</b>	11	9	2.5	37	25
<b>S2</b>	10	8	2.5	32	23
<b>S3</b>	7	6	4.5	35	29
<b>S4</b>	9	8	4	31	24
<b>S5</b>	9	7	4.5	30	24
<b>S6</b>	9	8	3.5	26	18
<b>S7</b>	7	5	2.5	38	25
<b>S8</b>	12	10	4	37	27
<b>ME1</b>	12	11	4	30	22
<b>ME2</b>	10	8	4	36	28
<b>ME3</b>	10	8	4.5	36	26
<b>ME4</b>	7	5	2	28	20
<b>ME5</b>	8	7	4	36	24
<b>ME6</b>	11	9	3	37	26

Table 6: Full & Updated Questionnaire, CPP, and Interview Scores across all interviewed Students & Managers/Executives.



Graph 1: This graph displays the questionnaire scores (out of a total of /13), the CPP scores (combination of current & potential work environment results out of a total of /5), and interview scores (out of a total of /48) for 14 selected individuals

The first step in our cross-analysis was to compare the scores from the questionnaire, CPP assessment and the in-depth interviews for the 14 selected participants with one another. The results were very surprising and contrasted with our expectations. We did not find any correlation whatsoever between these results. This meant that the two self-assessment methods of assessing strategic thinking ability have nothing in common when compared with the non self-assessment method - the CPP assessment. The results are as follows:

Method 1	Method 2	Correlation (-1 to 1)
CPP	Questionnaire	0.14
CPP	Interview	.004

Table 7: Correlation Coefficient Results for Comparative Assessment Methods on Full Questionnaire & In-depth Interview scores

The next step we identified following the results shown above was to delve a bit deeper into the data and examine what possible reasons there could be for these types of correlations. We decided to break down the in-depth interview scores into individual components (14) and then relate them back to the CPP scores. When we did this, 4 of the components from the interview: systems thinking, experience, intuition, and game theory displayed negative correlations with the CPP scores (-0.22, -0.20, -0.39, -0.23 respectively). This was possible for systems thinking and game theory as CPP does not appear to directly measure these 2 components, and we did not find any related competencies or any other parameters within the report or in the technical manual that states so. The third component identified as displaying a



negative correlation i.e. experience also made sense as even though CPP appears to measure experience indirectly (through preference for practical and experiential learning), we cannot take it for granted that it also measures attributes such as whether an individual is open to new experiences, or whether they are extroverted or introverted.

However, the negative correlation identified in the last component, intuition puzzled us slightly as both the literature and the CPP technical manual widely consider being intuitive to be an element of strategic thinking. When we examined the CPP reports further we noticed an unusual trend which has been highlighted in our analysis above demonstrating that the intuitive cognitive style was not amongst the most applied by participants who scored higher towards strategic thinking in the assessment. Across the cognitive styles of these participants, the ranking of intuition ranged in position from 4th to 11th. This explained our negative correlation for the last component. Therefore, even though intuition is a key component of strategic thinking, we removed it, along with the other 3 components discussed above to find a relevant correlation with the CPP scores. After the removal of four components: systems thinking, game theory, experience and intuition, the new interview scores when compared with the CPP scores showed a moderate positive relationship of 0.4. Similarly, when we removed 2 components: intuition and systems thinking from the questionnaire (experience and game theory were not present on the questionnaire) the new correlation with the CPP scores came out to be 0.26.

<b>Method 1</b>	<b>Method 2</b>	<b>Correlation (-1 to 1)</b>
CPP	Updated Questionnaire	0.26
CPP	Updated Interview	.40

Table 8: Correlation Coefficient Results for Comparative Assessment Methods on Updated Questionnaire & In-depth Interview scores

The second potential reason we identified was that the questionnaire and in-depth interview questions may not be relatable to students as they did not have relevant work experience to relate to, which was one observation that came out of the in-depth interview process. To find out whether this was true or not, we separated the 14 participants who took part in the interviews into students and managers/executives and calculated separate correlations for them with their combined CPP scores and identified the following results:

The correlation coefficient for students according to the full and updated versions of the questionnaire and Interview questions are displayed in the top row, and those of managers/executives in the bottom row:

Group	Questionnaire Score (Full version)	Interview Score (Full version)	Updated Questionnaire Score	Updated Interview Score
Students (CPP score)	-0.13	-0.30	0	0.27
Managers/Executives (CPP score)	0.48	0.54	0.54	0.58

Table 9: Correlations of Student & Managers/Executives CPP Scores with both the full and updated questionnaire and interview scores.

The above numbers clearly indicated to us that the questionnaire and interview scores for students do not correlate well with the CPP assessment scores, as the correlation between them is -0.13 and -0.30 respectively. However, the outlook of the correlations for managers/executives was significantly more positive at 0.48 and 0.54. When we removed 2 components: intuition and game theory from the questionnaire scores, and 4 components: systems thinking, game theory, intuition and experience from the interview scores, the results displayed were even better for managers/executives with correlations of 0.54 and 0.58 evident. However, for students, it was still the case that little to no correlation was found through this method.

Further to this, the information processing competencies displayed in the CPP report that facilitates strategic thinking were then compared individually with the interview and questionnaire scores and more significant positive correlations were found for managers/executives:

Scores	Analysis	Integration	Complexity	Logical Reasoning	Verbal Conceptualisation	Judgement	Quick Insight Learning
Interview scores (Full version)	0.62	0.71	0.67	0.80	0.77	0.44	0.57
Updated Interview scores	0.66	0.68	0.67	0.70	0.56	0.47	0.61

Table 10: Correlation of information processing competencies from the CPP Assessment associated with enhanced strategic thinking ability, and interview scores (full and updated) for managers/executives

Scores	Analysis	Integration	Complexity	Logical Reasoning	Verbal Conceptualisation	Judgement	Quick Insight Learning
Questionnaire Scores (Full version)	0.42	0.61	0.59	0.49	0.26	0.64	0.54
Updated Questionnaire scores	0.49	0.65	0.64	0.54	0.33	0.71	0.59

Table 11: Correlation of information processing competencies from the CPP Assessment associated with enhanced strategic thinking ability, and questionnaire scores (full and updated) for managers/executives

Now based on all correlations displayed above, we believe it is probable that our questionnaire and interview process is more suitable for managers/executives. To understand how significant this finding is, we then selected all the managers/executives from the study and compared their combined CPP scores with their questionnaire scores as a larger population (14) was available to examine, and the correlations found are as follows:

All Managers/Executives	Questionnaire Scores (Full version)	Updated Questionnaire Scores
Managers/Executives CPP scores	0.60	0.63

Table 12: Correlations of All Managers/Executives with Full and Updated Questionnaire Scores.

Similarly, when we performed regression analysis, and found the p-value (probability value), for the same set of data i.e. Questionnaire Scores and combined CPP scores of Managers/Executives, the following values were obtained:

All Managers/Executives	Questionnaire Scores (Full version)	Updated Questionnaire scores
Managers/Executives CPP scores	<b>0.021</b>	<b>0.015</b>

Table 13: P-values of All Managers/Executives with Full and Updated Questionnaire Scores.

What these values mean is that if an individual takes the questionnaire instead of the CPP assessment, the results of the questionnaire will be different from CPP scores only 2 times out of 100 for the full version and 1.5 times out of 100 for the updated version. This is quite significant considering that the questionnaire is just a list of 13 questions and participants self-assess abilities that are difficult to judge by themselves. This means that questionnaire may be able to identify strategic thinkers in a similar way to the CPP assessment for managers/executives. However, it is worth noting that the CPP assessment measures other important cognitive elements and parameters in more detail than the questionnaire, evident particularly through the information processing competencies such as complexity, logical reasoning, and verbal conceptualisation, where the questionnaire does not address or go into depth upon.

However, performing regression analysis for the in-depth interviews didn't make sense as we had only interviewed 6 managers. Yet when considering all the above examples it is evident that the interview had slightly better correlations than the questionnaire for managers/executives, hence we believe that if the same interview is conducted on more managers, it is probable we will see a more significant p-value, and more similar results when compared with the CPP assessment. The above data also indicates that the questionnaire and in-depth interview questions we developed do not measure the strategic thinking ability of students as well as CPP does. We believe the reasoning for this may be that students could not relate to, or find an appropriate context to the questions we asked since they were framed with an organizational context in mind.

Another implication that may be drawn from our findings is that the CPP assessment measures key cognitive elements of strategic thinking, particularly as our results showed strong correlations towards concepts such as creativity, integration, and conceptualisation. These concepts are related to cognition by Bonn (2005), and in Olson & Simerson (2015) concerning cognitive psychology, amongst others. We believe the reasoning for this is because the questionnaire was based on the key competencies identified from the literature, and if the CPP scores relate well with the questionnaire scores (managers/executives), this means that the reasoning found in the CPP assessment behind the elements that give rise to the ability to think strategically is close to the interpretation in the literature and is therefore a finding that would be expected. A final finding that came out of our analysis is that engineering and professional work-experience did not influence the ability of participants to think strategically since none of the three methods of testing strategic thinking showed considerable differences when the scores of managers/executives were compared with students and the scores of engineers with non-engineers.

## 6. Discussion

### 6.1 Research Question 1.1 What is Strategic thinking?

Our literature review identified a number of interpretations of what strategic thinking is directly. Steptoe & Warren et. al. believes it to be a novel way of thinking, and Heracleous (1998) describes its purpose to be the discovery of novel and imaginative strategies (Heracleous, 1998 p. 485). Bonn (2005) refers to strategic thinking as an ongoing, intertwined thought process (Bonn, 2005 p. 337), and Olson & Simerson (2015) as being alike constructing a mental road map that takes you from source to destination connecting the past, present and the future. Whilst it is evident from our literature review that there are many different interpretations of answering this, in our approach, we have drawn upon the current literature and our own understanding to address this research question, and to add value to the currently available knowledge.

#### *A multi-disciplinary, multi-dimensional approach*

Our examination of the currently available literature relating to strategic thinking has led us to recognise the multidisciplinary and multidimensional nature of strategic thinking as a concept in its own right. Strategic thinking transcends the boundaries of management practice through its focus on cognition, recognised by Bonn (2005) to be an area prior research has struggled to address, and a transition towards cognitive psychology evident through the research of Olson & Simerson (2015), who identify cognitive psychology; the study of perception, creativity, and decision making as one of their three components that comprises strategic thinking. The assertion emphasized through the management approach is that strategic thinking comprise of two thought processes: planning and thinking (Steptoe-Warren et. al., 2011) and has seen opinion divided across the divergent, creative, and synthetic approach proposed by Mintzberg and a more convergent, analytical approach proposed by Porter (Heracleous, 1998). Therefore, the scope of strategic thinking has widened further with the emergence of new concepts, and an understanding of strategic thinking as it applies to the group and the individual.

These factors have all contributed to the multidimensional approach adopted by contemporary research, evident in Bonn (2005) proposing a multi-level approach to strategic thinking through creativity, systems thinking and vision, integrating the micro and macro domains. Liedtka (1998, 2011) proposing strategic thinking comprises of a systems perspective, intelligent opportunism, intent, a hypothesis driven approach, and thinking in time as the five elements of strategic thinking, and the aforementioned Olson & Simerson (2015) who proposed three components, cognitive psychology, game theory, and systems thinking. The multi-dimensional approach of these authors and others in empirical research contributed to the diversity of the 15 core concepts we have identified. We would propose the multi-disciplinary collaborative research of recent years to be a strength in refining our understanding of strategic thinking, as a diverse subject matter that should be addressed through a diverse approach. Therefore, we identify the continuation of collaborative, cross-disciplinary research as an area where understanding is likely to develop.

### *Personalities, value systems, and environments*

The main purpose of our research into the core concepts and components of strategic thinking was to provide the perspective and knowledge necessary to improve our understanding and to enhance the viability of our study. However, we also believed it to be important to provide a meaningful contribution to the current understanding of the underlying dimensions that we envision to affect strategic thinking, and we believe our research also has the potential to address the current knowledge gap and to help others. The expanded approach to strategic thinking we have adopted draws inspiration from Prinsloo (Cognadev Technical Manual, 2016), and states that the environment, value system and personality of an individual are the three major factors that affect our cognitive preferences and therefore our strategic thinking ability. The Environment is referred to in the context Prinsloo intends, meaning exposure (Cognadev Technical Manual, 2016), which impacts the value system an individual follows, meaning what they deem to be right and what they deem to be wrong. When these factors are combined with an individual's unique personality (being creative, analytical, reflective, action-oriented, etc). all these factors influence the way we think, and therefore why we do and do not think in a strategic way. Our hope is that if we can test this model in more than a partial way, then wider implications towards strategic thinking may be identified as to what kind of environment, value system and personalities are favourable for thinking in a strategic way. This would perhaps enhance our understanding even further towards understanding what strategic thinking is, and assist any individual, group or organization seeking to improve their strategic thinking, as they will then know what to do to achieve this.

### **6.2 Research Question 1.2 Does CPP measure the strategic thinking ability of an individual? Can we isolate this ability through use of CPP and implementing our knowledge of the core competencies of strategic thinking?**

The first aspect of this research question asks if CPP is able to measure the strategic thinking ability of an individual? The initial review of the CPP Technical Manual indicated to us that CPP does measure strategic thinking ability of individuals as it is designed to directly measure many of the key concepts of strategic thinking that we have identified from our literature review such as creativity, conceptualising and use of intuition. Our results from the analysis for managers/executives were also in line with our initial thinking and indicated that CPP is able to measure key cognitive elements of strategic thinking. However, according to our research, there are certain elements CPP may not be able to address if we accept the argument that strategic thinking is multidimensional in nature - namely, experience and game theory. It is important here to note that our study was conducted on a relatively small sample of individuals, so drawing any conclusions from our analysis needs to be assessed whilst bearing this in mind.

### ***Managers & Executives, Correlations, and the Importance of Organisational Context***

The role of cognitive ability in strategic thinking and the results of cross-analysis for managers/executives against our self-assessment tools and the CPP assessment itself are the areas where we can draw positives from and offer opportunities for potential future development. We wish to discuss these concepts in more detail as they may hold important wider implications in our ability to measure strategic thinking. The first area to highlight is that our approach may be more applicable to measuring strategic thinking in managers/executives, as those with an organisational context on which to base their responses seem to correlate more closely to our own self-assessment methods. This first became apparent to us as a possibility when we made our initial correlations (Appendix E) separately between students and managers/executives and identified a zero correlation between students' CPP results, and their questionnaire and interviews scores (8 students in total).

However, when it came to the 6 managers/executives, a weak to moderate correlation of 0.48 was identified when comparing the CPP results to the background questionnaire and when analysing CPP results with the in-depth interviews, the correlation was slightly stronger at 0.54. Once we had updated our questionnaire and interview to exclude questions where collectively no parallels were drawn, namely those relating to experience, games theory, intuition, and systems thinking, the correlations became even stronger. The correlation for the CPP assessment compared to the questionnaire now came to 0.54 and rose to 0.58 when compared to the interview. To find out how valuable the correlation was, we checked the CPP results of all 14 managers in the study and compared them with the background questionnaire scores, and identified the correlation to be 0.60 for the full version, and 0.63 in the updated version that omitted 2 questions addressing intuition and systems thinking. Lastly, when conducting the regression analysis to assess p-values between the CPP assessment and the full and updated questionnaires of all managers/executives, the results came out at 0.021 in the full version, and 0.015 in the updated version. This would indicate that the developed self-assessed methods are able to predict strategic thinking ability for managers/executives almost as good as CPP. However, again it is important to state that these results must be considered from an understanding that 14 managers completed the process in total, and further testing would be required to draw more conclusive outcomes.

The results identified bring us onto the potential importance of the context. There was a significant contrast between the correlations of students, wherein negligible to weak correlations are found across all parameters, and managers/executives, wherein moderate correlations are found when their results are looked upon in isolation, increasing when particular variables are excluded. The reasoning we believe for the substantial difference between students and managers/executives results may be due to the organisational context that managers/executives were able to apply to our self-assessment methods, whilst students may have struggled to relate to certain questions without this context. That is why we believe organisational context or perspective presents a valuable route to explore in future research. As mentioned in chapter 3.1, the management school of thought has also highlighted the benefits of strategic thinking to the organization, as this provides a reference point, a context or a perspective in which to apply strategic

thinking ability, and based upon our findings from managers and executives there is strong reasoning for the need of an appropriate context in the corporate environment.

### ***The Importance of Cognition in Strategic Thinking***

Our literature review identifies the organisational focus of management research in detail, however, the cognitive approach that is particularly evident in psychological research provides a different perspective that is more relevant to the individual. The role of cognition in strategic thinking is gaining prominence in contemporary research as is evident in the work of Bonn (2001, 2005), Liedtka (1998 2011) and Olson & Simerson (2015) amongst others. It is this area that our research provides additional insight into how to approach measuring and isolating strategic thinking that is also apparent through the use of CPP and our own self-assessment methods. The CPP assessment identifies a current and potential work environment, and this is the main area of focus towards the user's results when addressing the test's intended focus of applying strategic thinking in the right working environment. However, in our study, some of the greatest insights were found in the information processing competencies, once again primarily for managers/executives with less conclusive findings for students.

For managers/executives, strong correlations were found when comparing interview and questionnaire scores with information processing competencies such as integration, logical reasoning and verbal conceptualization, which all relate to themes we identified in the strategic thinking literature. Integration is related to being able to synthesize ambiguous information, logical reasoning to being process oriented, and verbal conceptualisation related to creativity (Cognadev Standard Report, p. 17).

### **6.3 Research Question 1.3 Does work experience and educational background have any influence on the ability to think strategically?**

There were no significant correlations drawn between participants' work experience and whether they were from an engineering or non-engineering background. In all the three methods we used in the study, the questionnaire, the CPP assessment, and in-depth interview, there was no significant difference between the results.

#### **Work Experience**

The correlation between combined CPP results and in-depth interview questions relating to the experience provided no correlation for all participants and a negative correlation was also identified when we analysed the experienced managers/executives separately. One possible explanation for this could be that since the in-depth interviews were self-assessed, there may be problems with an individual's ability to assess their own ability, or also refinement needed to the questions that relate to this topic. Experience is also a more practical construct than many of the cognitive abilities we relate to strategic thinking, and therefore require a different perspective when assessing self-ability. Whilst all the above is possible, we believe that a larger and wider cross-sample of less experienced and more experienced individuals would be needed to draw more objective conclusions.



Lastly, as we did not find much difference in the data, this indicates strategic thinking may be impacted more by the environment, value systems and the personality of an individual, and that both background and work experience may not have an impact on the ability to think strategically. Therefore, we would argue that exposure is more important than experience in refining strategic thinking ability and identify with Prinsloo's argument that time does not have much of a role to play, but rather exposure to the right environment instead (Cognadev Technical Manual, 2016).

### **Educational Background**

A parameter we considered when answering this question was if we were able to notice any differences in strategic thinking ability between engineers and non-engineers. To examine this, we grouped both students and managers/executives responses into either engineering/non-engineering sets based on their educational background. When analysing the background questionnaire, it was apparent that engineers had scored themselves as slightly more proficient in all questions relating to strategic thinking concepts (Appendix D).

However, the CPP assessment results demonstrated an insignificant difference between the engineers and non-engineers. The in-depth interviews also showed an insignificant difference in the ability of engineers and non-engineers to assess their competency of strategic thinking in more detail, with average scores between these two variables again being similar. This implies that having an engineering or non-engineering background did not impact the ability to think strategically. However, it is worth considering again that only 15 participants we assessed had an engineering background, and therefore to provide more objective results, a large sample of individuals from both backgrounds would be preferable.

## 7. Conclusion

Strategic thinking as a concept and the merits of being a ‘strategic thinker’ have been discussed with increasing frequency in contemporary literature (Bonn, 2001). However, despite there being widespread consensus on how crucial strategic thinking is (Mintzberg, 1994a, b; Bonn, 2001; Graetz, 2002; Tavakoli & Lawton, 2005), there is no conclusive definition of what it is (Bonn, 2001) and no tangible or usable method of assessing this ability. We conducted this study to address this problem by first clarifying what exactly strategic thinking is, and then measuring and isolating this ability in practice, through the use of a multi-method approach.

We first conducted a thorough literature review and realised that strategic thinking is multidisciplinary concept occurring on multidimensional levels. In addition, strategic thinking is affected primarily by three factors: an individual’s personality, their value system and the environment they are exposed to. We then identified 15 core competencies of strategic thinking from the literature where we found consensus across multiple credible sources. Following this, we developed our own self-assessment methods (a background questionnaire and in-depth interviews) to measure strategic thinking ability alongside the CPP test, a non self-assessment method. Through these methods, we were able to compare and contrast data to identify correlations that addressed our research questions. The 40 Participants were selected non-randomly to take the background questionnaire and the CPP assessment and 14 for the in-depth interviews. When comparing the results of our self-assessment methods with the results of the CPP test, no correlations were found. However, when we divided the results into two categories: students and managers/executives, and then compared results of questionnaire and interview with CPP, we found some positive correlations for managers/executives. We found some correlation between the methods we developed based upon strategic thinking in the literature and the CPP assessment from the results of managers/executives.

Our multi-method study involving CPP and our own self-assessment methods has demonstrated a certain amount of ability in measuring and isolating strategic thinking in individuals from a managerial or executive background, which may indicate the importance of an organisational context to the method we have devised. We identified no apparent correlation between our participants work experience, educational background (engineering/non-engineering) and the CPP assessment. Additionally, our method has cast doubt on the importance of certain aspects of strategic thinking in practice such as experience, where we found no conclusive evidence of a link between strategic thinking. We also found no apparent correlation with game theory. Our method has however struggled to address aspects of strategic thinking that are more strongly linked to cognition, namely the value of intuition and systems thinking. This indicates a need for further refinement of our method, and a need to expand the experiment itself to a wider population. We would hypothesize that testing managers/executives across varying levels of experience would help to further assess the value of the strategic thinking concepts (experience, game theory, intuition, systems thinking) where we found no correlations.

## **Practical Implications and Contributions**

This study sheds light on what strategic thinking is and what the core concepts of strategic thinking are through analysis of the current literature. Our research then attempts to measure and isolate strategic thinking ability through a quantifiable approach of our own self-assessment methods based on the theory with the CPP assessment in practice, a unique design and concept. This study has identified potential areas of expansion for measuring and isolating strategic thinking ability in individuals, and through experimentation, has identified areas that may not contribute to this understanding. Our research will provide immediate development opportunities for the ongoing research project at the Lund University School of Economics and Management, whilst also providing value to organisations who want to hire, or are looking to develop their employees, as well for those who wish to develop their understanding of strategic thinking, and individuals who wish to assess their own strategic thinking ability.

## **Recommendations for Future Research**

This study is the starting point of part of an ongoing broader research project, and as such, it is worth noting that our findings will be considered in the context of this project, and refinements made as required. There are already plans to assess a wider pool of individuals from diverse and varying backgrounds so as to examine further variables, to highlight further dimensions that comprise an individual's ability to think strategically. Regarding the CPP assessment, we would agree with sampling more individuals and would recommend examining a wider sample pool of 150-200 (or more) managers/executives with varying degrees of experience. The purpose we would propose is to examine if there is a more distinctive correlation evident between strategic thinking concepts as defined by the literature, and participants CPP assessment results across managers of varying degrees of work experience. This may provide more objective or conclusive results.

Follow up studies that we believe may prove to be beneficial, and provide a more developed understanding include the following:

1. Use the same set of questionnaire and interview questions and relate them with CPP scores across a wider population consisting of managers with varying degrees of work experience to identify more profound findings.
2. Refine the existing questionnaire and interview questions in order to assess student's ability in a more beneficial way.
3. The consideration of other themes, identified through our model of Strategic Thinking. Areas we would recommend expanding upon include values, beliefs and cultural or language backgrounds of individuals.

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# Appendix

## Appendix A - Participant Background Questionnaire Template

### Participant Background Questionnaire

Please fill out the following questionnaire prior to completing the CPP and VO assessments.  
Note: If any question does not apply to you please state 'NA'.

**Email address \***

hi1664si-s@student.lu.se

**Full name of the participant \***

Himanshu Singh

**Age \***

0

**Gender \***

- Male
- Female

**Nationality \***

NA

**Are you currently: \***

- Student
- Manager/Executive



Your current level of English language \*

- Beginner
- Intermediate
- Advanced
- Fluent

Please state the discipline(s) of your bachelor degree programs you have completed: \*

NA

Please state the discipline(s) of postgraduate degree programs you have completed: \*

NA

Please state the duration of your managerial/executive work experience to date in years. \*

NA

Please briefly describe your managerial/executive work experience: \*

NA

To what extent do you consider yourself analytical? \*

	Not at all	Slightly	Moderately	Very	Extremely
Select	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

How creative are you? \*

	Not at all	Slightly	Moderately	Very	Extremely
Select	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

How important it is for you to use intuition in day to day life? \*

	Unimportant	Of little importance	Moderately important	Important	Very important
Select	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Select

---

**Do you try to create visual images of where you want to be in the future? \***

Never Seldom Sometimes Often Always

Select

---

**Do you constantly seek information from multiple sources? \***

Never Seldom Sometimes Often Always

Select

---

**How important is thinking at an abstract level to you? \***

Unimportant Of little importance Moderately important Important Very important

Select

---

**How often do you make generalizations from what you observe? \***

Never Rarely Occasionally Frequently Very frequently

Select

---

**Do you ask a lot of questions? \***

Never Seldom Sometimes Often Always

Select

---

**Do you believe in considering the interests of multiple stakeholders involved in a decision even if they have contrasting opinions to yours? \***

	Never	Seldom	Sometimes	Often	Always
Select	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

To what extent do you challenge the status quo or underlying beliefs and assumptions? \*

	Never	Seldom	Sometimes	Often	Always
Select	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Do you always try to synthesize all the information available to you? \*

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
Select	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Do you spend a lot of time reflecting on both successful and unsuccessful outcomes? \*

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
Select	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Do you appreciate the perception of organization seen as a holistic system where systems behave, interact with their environment and influence each other? \*

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
Select	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

**Thank you for completing the questionnaire. Your answers are highly beneficial to our study.**

## Appendix B - In-Depth Interviews Questions and Answers

---

Each question awards one point where a theme identified from strategic thinking is broached upon. Points are then added up at the end to see how the participant scores.

### **Discovery/Scanning/Intelligence/Intent focused**

Q. You stated on the background questionnaire that you frequently search for information from multiple sources. Why?

A. Possible answers may include searching for threats/opportunities or to garner business intelligence or gather more information to make better decisions.

Q. What type of information do you seek from multiple sources?

A. Effective scanners seek information in these areas: technology, government and regulatory, economic, demographic, cultural, industry and market.

Q. Would you say that you are generally able to pick up on or detect ambiguous threats? If yes, would your colleagues/friends agree?

A. The respondent should be able to clearly understand what is being asked and state they are generally able to do so. Colleagues and friends are also referenced to confirm/disconfirm this answer.

Q. Would you be able to provide an example of this ability?

A. The respondent should be able to provide an example where they were able to identify an ambiguous threat and ideally how they resolved this without being prompted to do so.

Q. Have colleagues/friends told you that you ask good questions?

A. The answer should be that colleagues/friends have stated to the respondent that they generally do so.

Q. Would you say you are usually able to focus your attention, resist distractions and concentrate for as long as it takes to achieve your goals and objectives? If yes, would your colleagues/friends agree/disagree?

A. Liedtka (1998) identifies all the above traits as exemplary of strategic intent. Point awarded for the yes answer. Asking about peers is to affirm the previous question. Only ask if the participant states yes to the prior question regarding themselves. Point awarded for confirmation again. No point awarded for a 'no' answer or if the question isn't relevant due to a 'no' response to the above question.

Q. Are you able to quickly adapt to a situation without outside help or assistance? Can you provide an example of a time you did so?

A. Answering yes would be instructive of 'intelligent opportunism' (Liedtka, 1998 citing Burgelman). Asking for help/assistance or saying you are not able to would suggest otherwise.

---

### **Abstraction**

Q. Can you easily identify or grasp the theme/essence even in different types of information? If yes, please provide an example.

A. People who are skilled at abstracting are able to grasp the essential theme or synergy in disparate bits of information and in such a way that leads to action - Linkow (1999)

Q. Are you able to deal with situations where you are bombarded with huge amounts of data? If yes, please provide an example.

A. Abstraction helps to deal with such a scenario by filtering data to essential elements. - Linkow (1999)

---

### **Synthesis/Interpreting**

Q. Do you actively look for missing information and evidence that disconfirms or disproves your hypothesis/understanding?

A. Acc. to Schoemaker, Krupp & Howland (2013), this improves your ability to interpret.

Q. Do you prefer operating in situations where there is clarity or are you able to push through any ambiguity?

A. Schoemaker, Krupp & Howland (2013) identify the ability to push through moments of ambiguity as demonstrating an ability to synthesize and therefore to think strategically.

Q. Are you able to address multiple problems or issues concurrently? Please provide an example of when you did this?

A. Nuntmanop et. al. (2013) citing Boar (2000) identify strategists as having this capability and that this ability to synthesize lies at the heart of strategic thinking.

---

## **Holistic understanding and Systems thinking**

Q. Do you approach complex situations as whole entities or do you break down complexity into smaller parts?

A. Strategic thinkers break down complexity (multiple sources) point awarded for this answer.

Q: Do you predominantly involve yourself in day-to-day operations, or do you tend to distance yourself from day-to-day operations to examine wider issues?

A. Viewing an organization holistically requires the ability to distance oneself from day-to-day operational problems (Garratt, 1995) and to see how different problems and how they influence each other and what effect one solution in a particular area would have on other areas (Liedtka, 1998).

Q. Do you predominantly focus on isolated individuals and events or processes and underlying structures that shape individual actions? Please could you provide an example?

A. Senge (1990) has called the above approach ‘Systems Thinking’ arguing we must look beyond personalities and events and look at underlying structures which shape individual actions and create opportunities that make these events become likely. This involves thinking in terms of processes rather than events to enable a reconciliation of apparent contradictions and the development of innovative solutions.

\*These questions and answers are sourced from quotations and discussion by Bonn (2005).

Q. If presented with choices can you easily identify how a will effect b, which will affect c, and so on?

A. Systems thinkers will examine cause and effect dynamics.

---

## **Creativity**

Q. Are you considered to be creative by your colleagues/friends (Y/N)?

A. This question is designed to affirm/disaffirm the respondent’s answer to the initial question of the background questionnaire of ‘are you creative?’

Q. Can you give us any examples of your creativity?

A. The reasoning behind this question is see what examples the respondents state so we can review across all interviewees and the CPP assessment results to see if there are any particular examples purely strategic-minded people are drawn towards.

Q. Are you invited to any events or workshops because of your creativity? Please elaborate.

A yes/no response is to be expected followed by an example or examples if the respondent states yes.

Q. Do you feel comfortable dealing with ill-structured environments?

A. Bonn (2005) remarks that strategic thinkers are able to react to ‘ill-structured environments and deal with highly complex problems and decisions

---

### **Vision**

Q: How far in the future do you try to visualize the future state for yourself/organizational unit or dept. you are in charge of.

A. Pure Strategic 5-10+ years

Parallel processing 3-5 years

Tactical strategy 1-3 years

Diagnostic accumulation 3 months-1 year

Pure operational 1day to 3 months

Q: Once you have a visual image of the future what do you do afterwards?

A potential answer should be trying to work on it step by step backwards and plan for how to reach there. Managers usually have the chance to work on it but in case of students it might be that they use it to plan their short term or long term goals etc.

Q. Can you give us an example of where you visualized any future state and how you reached there?

A. Examine the response to see the depth of thinking from the respondent. They should clearly be able to demonstrate an example and the steps they went through to reach their goal.

Q. How good is your visual memory? (From scale of 1 to 5 and 1 being the lowest)

A. “People with high envisioning capability tend to have excellent visual memories” Linkow (1999).

Q. How much time do you spend thinking about the future? (From scale of 1 to 5 and 1 being the lowest)

A. “They spend a great deal of time thinking about the future” Linkow (1999).

Q. Do you use any visioning methods or tools to envision different possible future states?

A. Examples - Delphi method, Scenario planning - check if respondents use their own models or any methods from literature.

---

### **Challenge/Reframing**

Q. Are you able to provide an example of where you challenged the status quo or existing beliefs and assumptions.

A. An example should be able to be provided where the respondent is visibly seen to challenge the status quo existing beliefs or assumptions in a reasonable way with a positive outcome.

Q. Do you welcome conflicts or are you comfortable with naysayers in group work? If yes, please give an example.

A. The appropriate answer would be to welcome conflicts and to be comfortable around those with naysayers and conflicting opinions. The example should incorporate both the above aspects.

---

### **Divergent**

Q. Do you have a tendency to look at problems from different angles or perspectives or do you use systematic, tested solutions?

A. The correct answer would be different angles and perspectives a trait of being divergent.

Q. Would your colleagues/friends agree that you tend to approach problems from different angles and perspectives? If yes, can you tell me their names.

A. Confirms/disconfirms the response above. Asking for specific names is to intentionally throw the respondent off and to see if they are able to provide specific examples.

---

### **Analytical**

Q. Do you try to make decisions after considering all the information that is available or are you satisfied with the earliest possible solution? If yes, do your colleagues/friends agree?

A. Analytical thinkers would consider all the information they can source. Colleagues and friends should also confirm this.



Q. Do you effortlessly digest large amounts of data in a relatively short amount of time? If yes, please give an example.

A. Those who are analytical are able to do so. The example should be reviewed on discretion and checked to see if it is consistent with the respondent's other answers.

-----

## **Experience**

Q. Would you characterize yourself as being extroverted or introverted? How would your colleagues/friends describe you?

A. Selecting extrovert would be the preferred answer here. Dragoni et. al.'s 2011 study has linked being extroverted with an ability to gain more executive experience.

Q. Would you describe yourself as being generally open to new experiences? Would your colleagues/friends describe you as being open to new experiences?

Q. Can you provide an example?

A. Openness to new experiences alongside extraversion is highlighted in the Dragoni et. al. (2011) study as being a trait enabling enhanced strategic thinking. Peer/Colleague review can be assessed for validity of statement.

Q. Did you make significant efforts to become knowledgeable about the organization you worked/working for and the industry they operate in?

A. Linkow (1999) - Experience is a critical success factor for general managers. They must be very knowledgeable about the industry in which they compete and about the organizations where they work.

-----

## **Intuition**

Q. Do you primarily operate based upon your intuition or do you carefully plan based on thorough fact based analysis?

A. Liedtka (1998) Mintzberg (1994) identifies strategic planning as a process aimed at programming already identified strategies, whilst strategic thinking is a synthesizing process utilizing intuition and creativity. Point to be scored for the intuitive answer.

Q. Do you use any methods or models to draw upon your past experiences when approaching a complex problem/decision?

A.Examples: (mental maps, written i.e. learning journal)

Fiol & Huff (1992) characterize mental maps as a decision aid focussing on sub-areas of cognition, Chevallier (1974) also highlights the importance of mental maps to 'graphically breakdown problems'. Strategic concerns according to Fiol & Huff should make use of a portfolio different kinds of cognitive maps that interact with one another. If yes check the nature of these maps based on examples in the literature, the term mental map may also be taken to be informal maps or mental models of the participant's own creation, in this circumstance question further the structure of how they map things out and how a typical process might work.

Keeping a journal is a method highlighted by Mintzberg (1994) (amongst others) to improve future decision making processes and strategy. An example may be requested - particularly as MiM students are advised to keep a learning journal as part of the programme. Alternative models will have to be assessed through their applicability to strategy - in particular strategic thinking, certain models e.g. Porter's 5 Forces are synonymous to executives and students and an example of use should be requested here to display it's value to the individual.

-----

### **Game theory/Valuating**

Q. Do you regularly play strategy based games such as chess or any business simulation games?

A. (non-cooperative games typically involving 2 or more players attempting personal gain in some area with success resulting in loss for the other player). Zero-sum games recognize a fundamental tenet: other players are opposing players and what is in one player's best interest is likely harmful to others. (Olson & Simerson, 2015) Point awarded for 'yes' in Chess/Similar strategy based game or business simulations.

Q. Do you have certain methods or tools you use to anticipate competitive or resistive forces in the future?

A. Olson & Simerson (2015) state that game theory is chiefly about how an individual deals with change and resistance. Point awarded if a tangible method is identified by participant.

Q. Do you find yourself easily preoccupied or do you lose your attention easily when completing a task where you are required to cooperate with other parties or people?

A. Olson & Simerson (2015) state - as above ' intent. Such cooperation and positive results are less likely to occur if either party is not paying attention or is preoccupied. Point awarded for a positive response here.

Q. Do you always have contingency or countermeasures planned in advance in case anything goes wrong? If yes, please provide an example.

A. Olson & Simerson (2015) state adverse or competitive situations require planned action, including contingency or countermeasures.

Q. Are you good at understanding the underlying values, beliefs, and attitudes held by other people?

A. Linkow (1999) - People who are experts at valuating seek to know and understand the underlying values, beliefs, and attitudes held by current and potential stakeholders.

-----

### **Inductive/Hypothesis driven**

Q. Do you prefer to operate based on careful reasoning or are you driven by your own assumptions or hypotheses?

A. Liedtka (1998) amongst others recognizes that strategic thinking is an hypothesis driven process in that it deals with hypothesis generating and testing as its central activities.

Q. Do you run any experiments to form generalizations? If yes, please give an example.

A. Linkow (1999) - People who excel at inducting often run a series of small scale, Low risk experiments to generate a range of observations.

### **Learning Ability/Reflective**

Q. Can you give us any example where you studied your's or your team's failure and learned any lessons out of it?

A. Strategic leaders study failures—their own and their teams'—in an open, constructive way to find the hidden lessons. - Schoemaker, Krupp & Howland (2013)

Q. Do you openly acknowledge your mistakes? Can you provide an example?

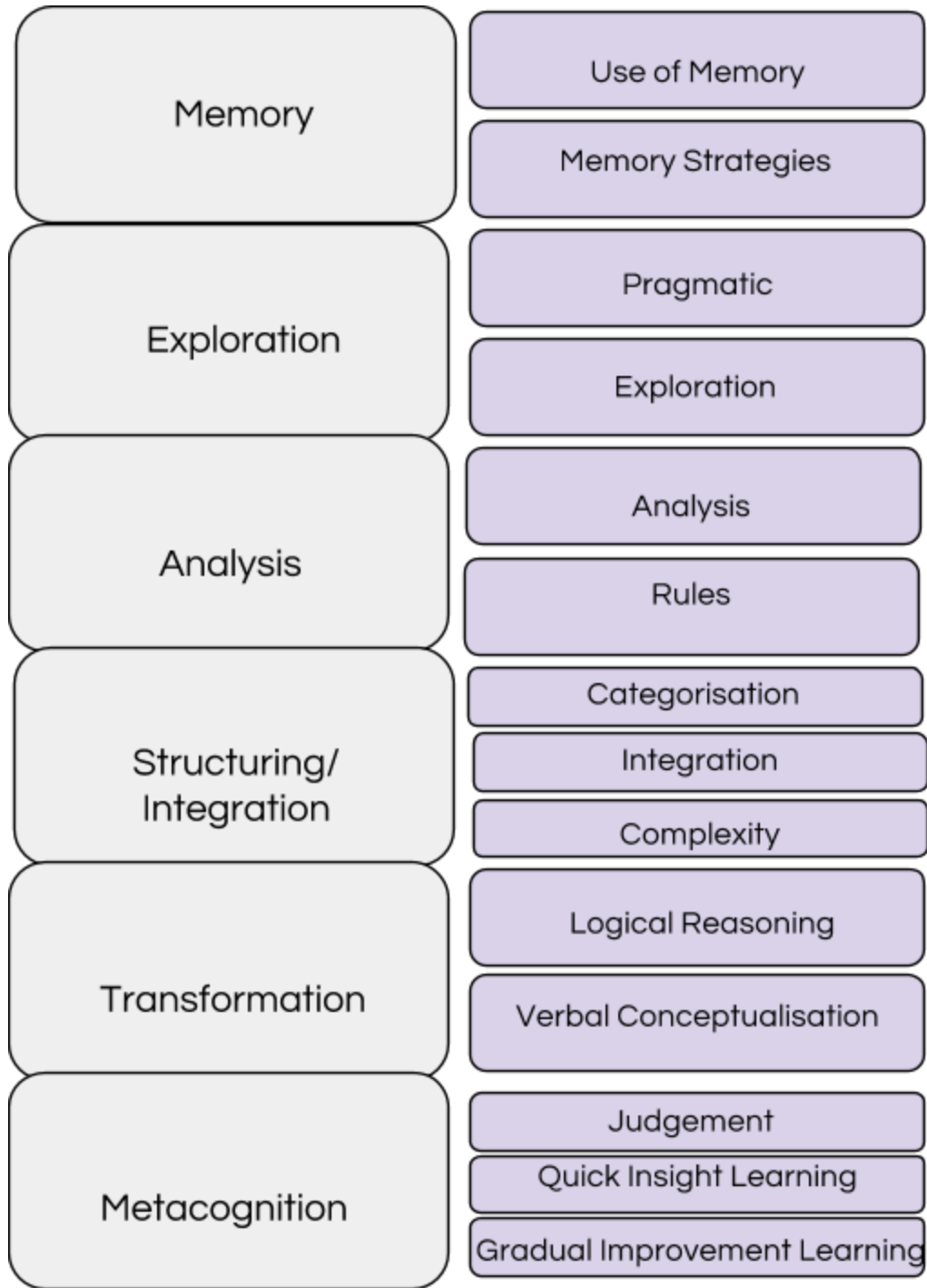
A. Schoemaker, Krupp & Howland (2013) Yes, strategic thinkers typically acknowledge their mistakes.

Q. How do you reflect upon successful and unsuccessful outcomes?

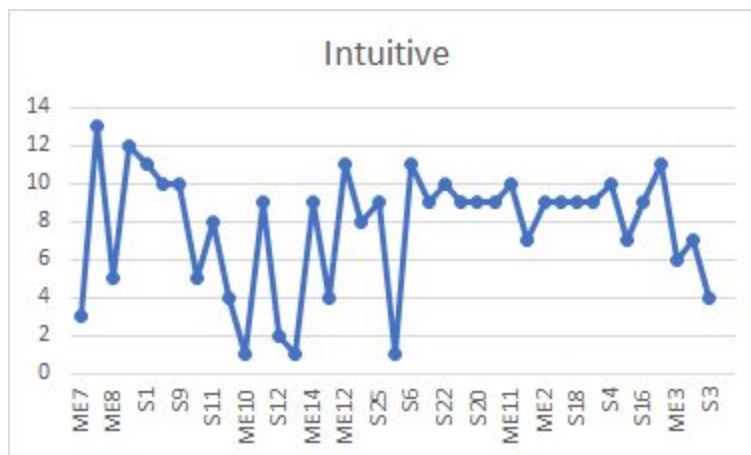
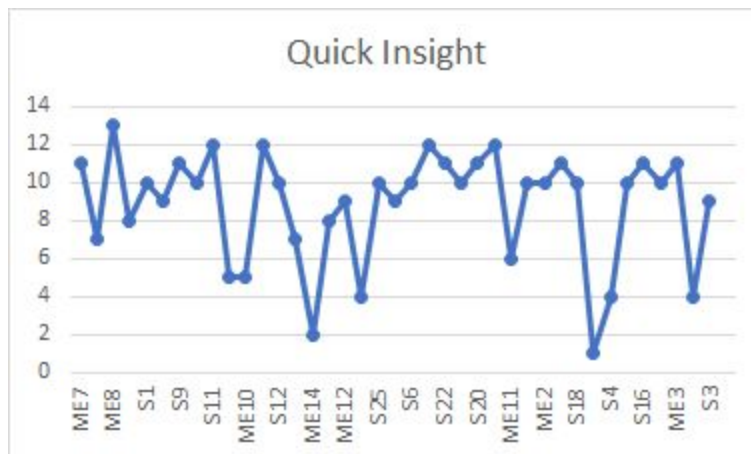
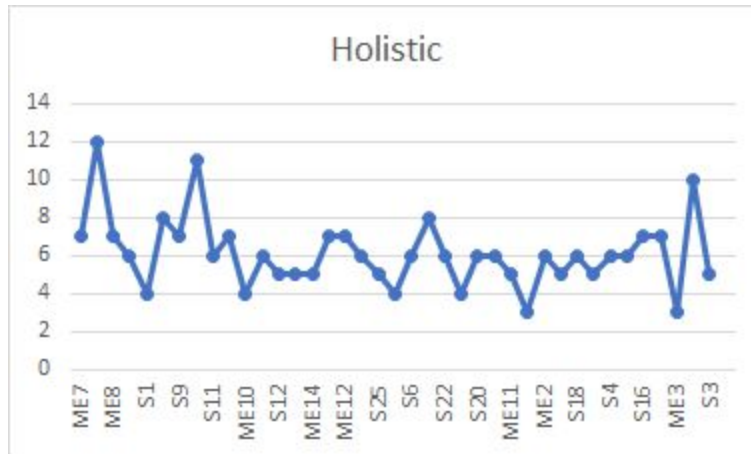
A. One answer can be by going back to Diary/Learning journal/document or dedicating a certain amount of time to reflect.

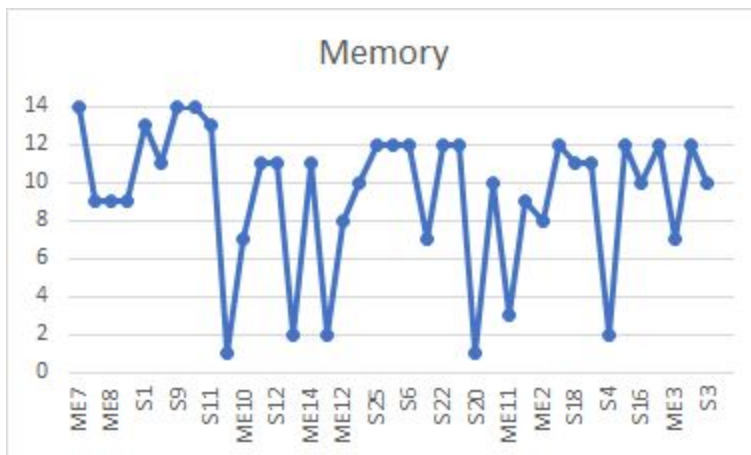
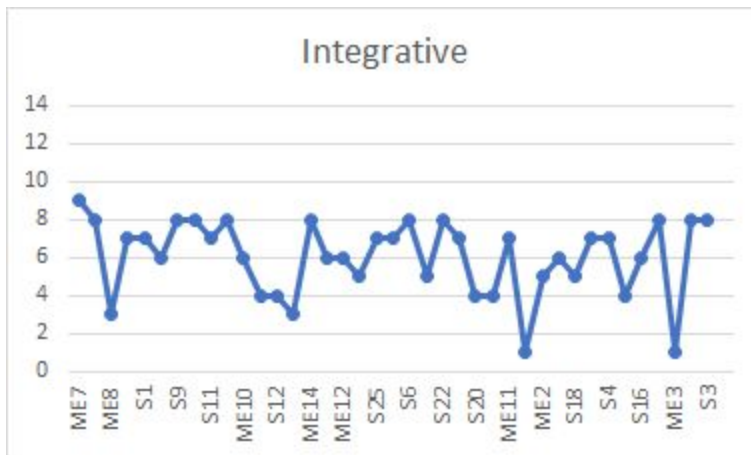
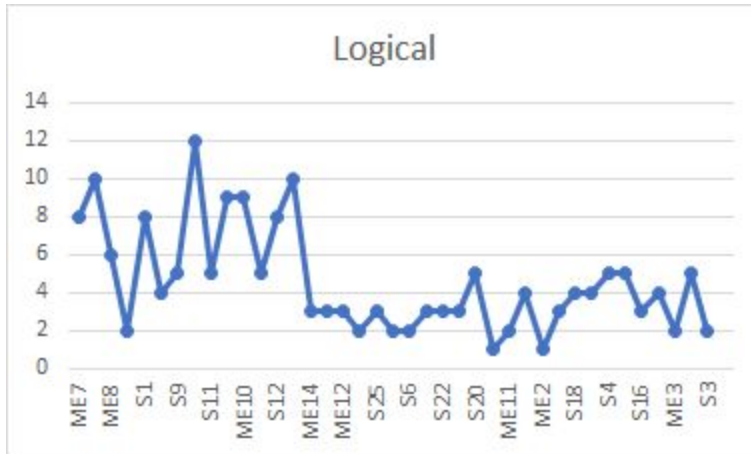
## Appendix C - CPP

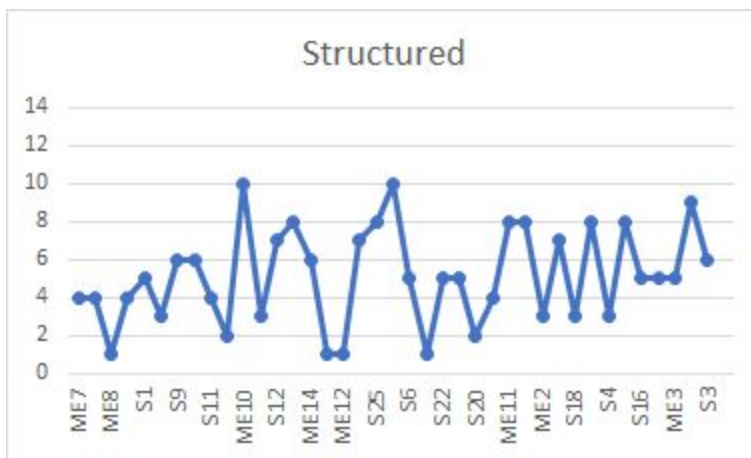
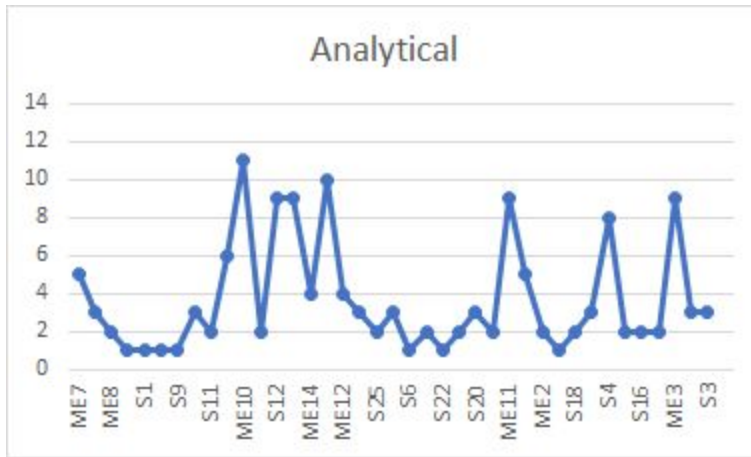
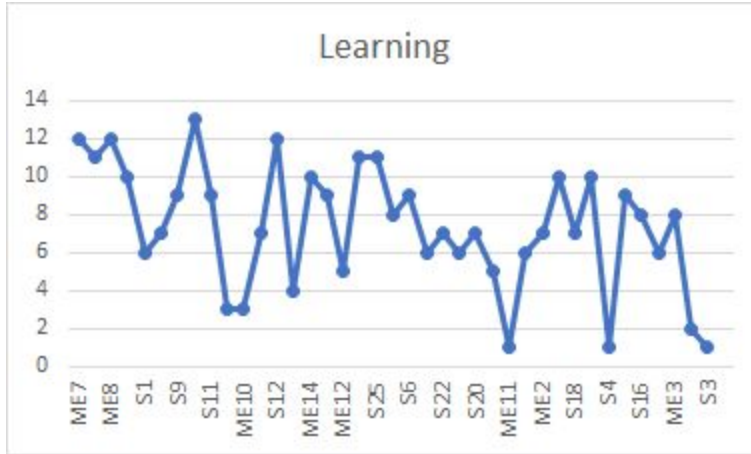
Figure: Information Processing Competencies that contribute to enhanced strategic thinking ability. Adapted from Information Processing Competences (Section 11) (Cognadev Standard Report, 2017, p. 17).

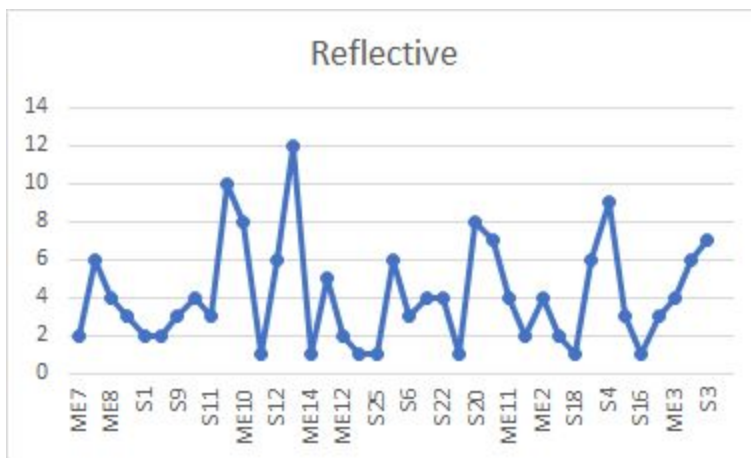
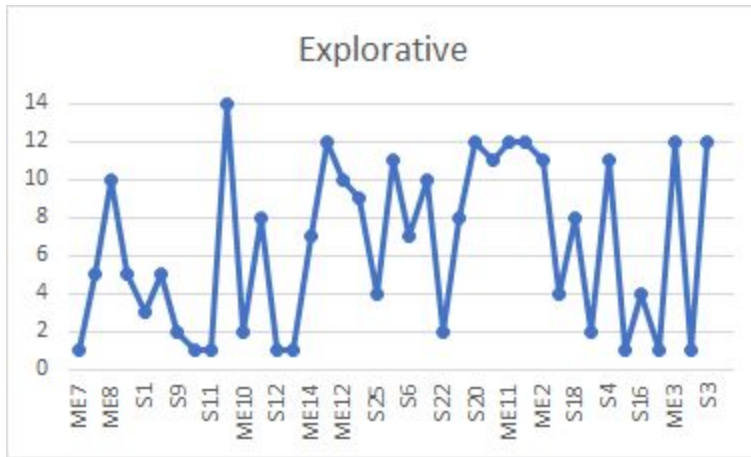
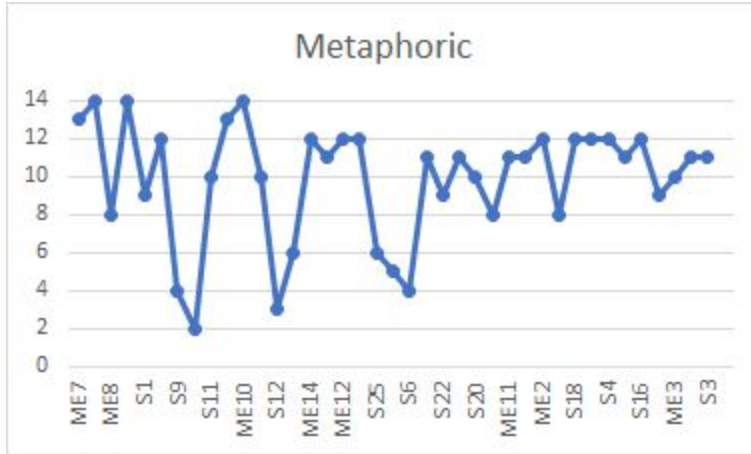


Line graphs for cognitive styles. Graphs are arranged in order of participants from Operational towards Strategic orientation.

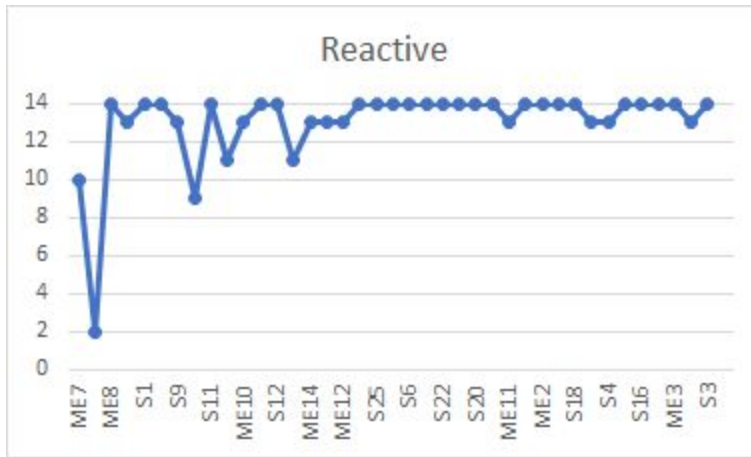
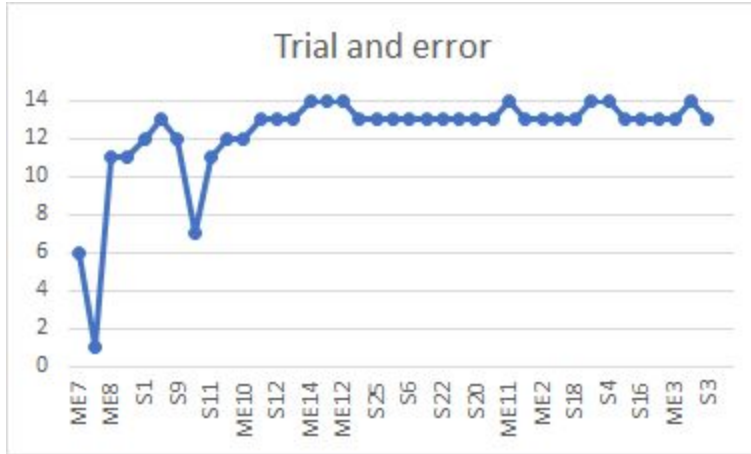




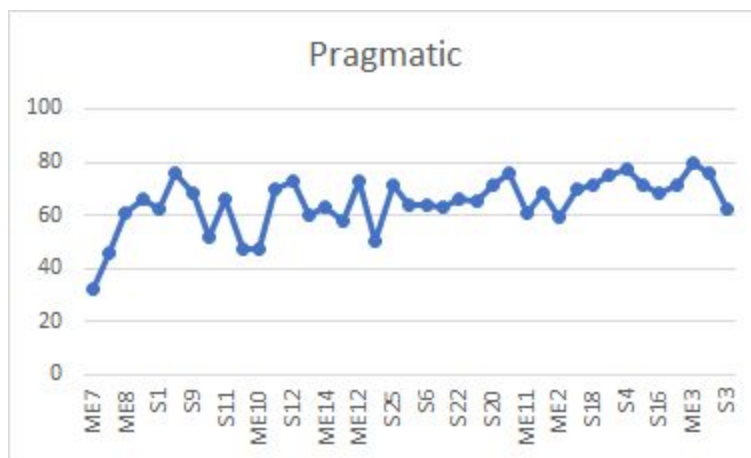
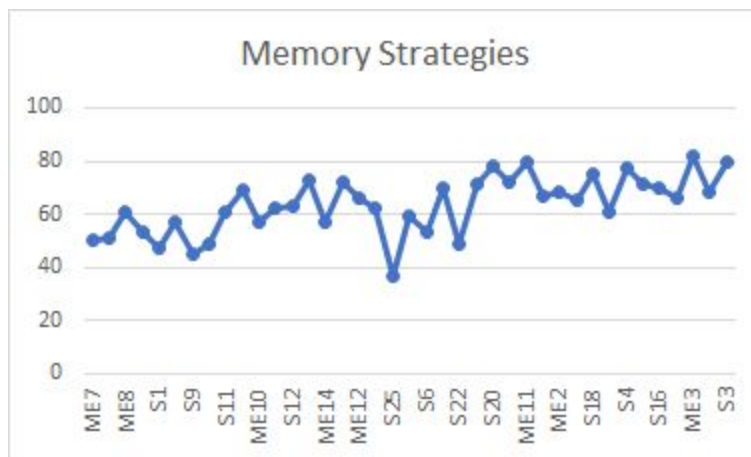
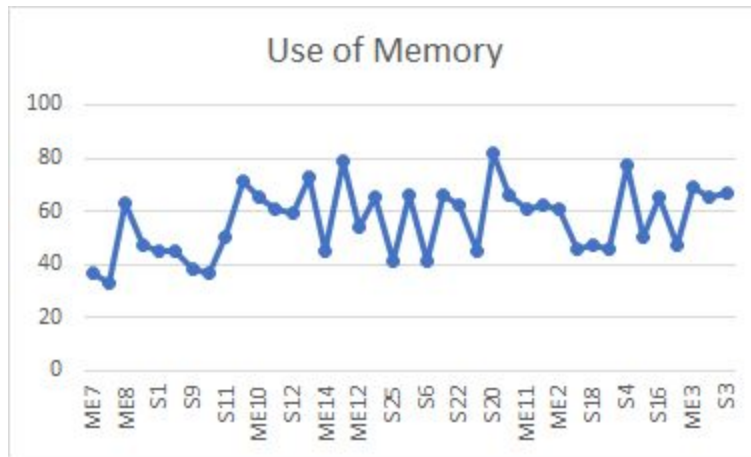


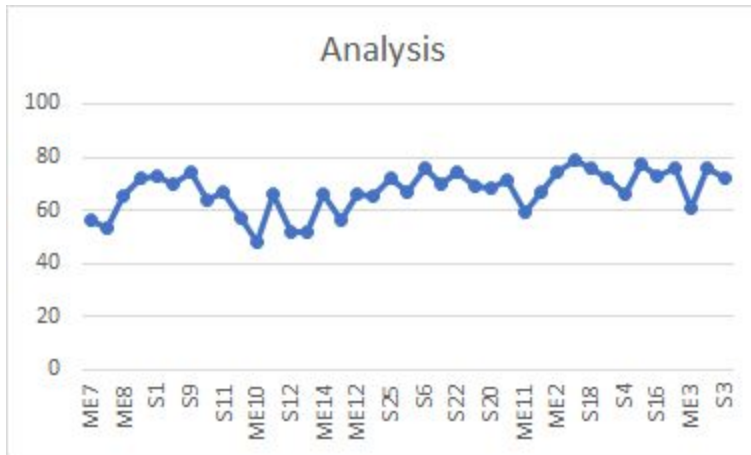
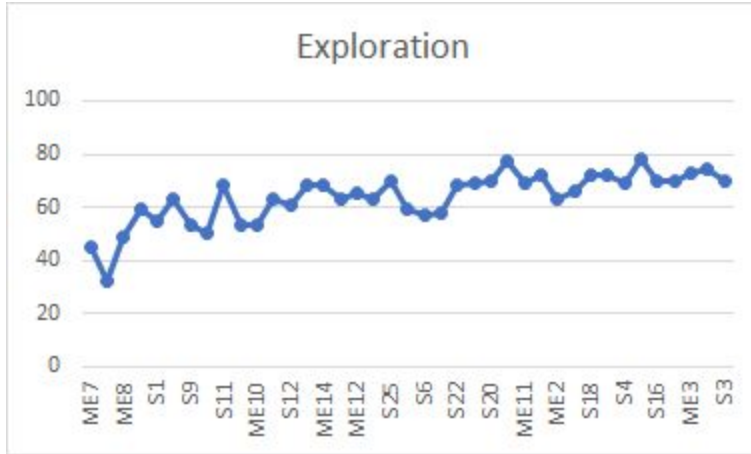


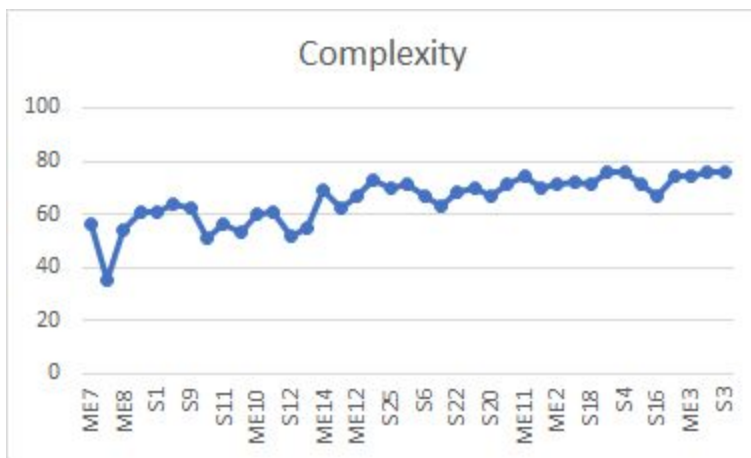
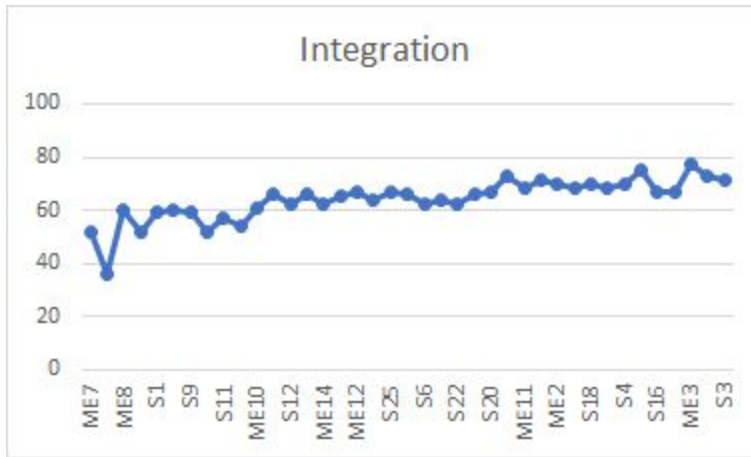
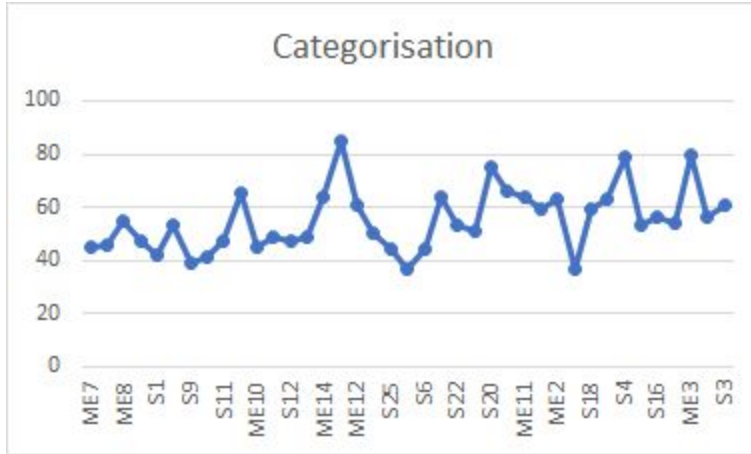


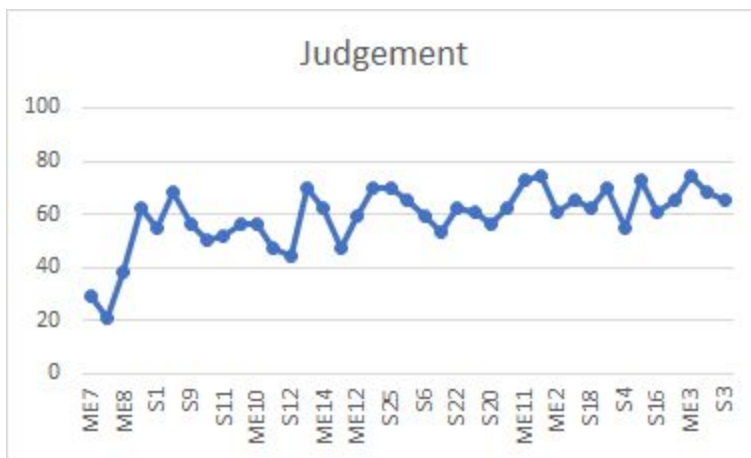
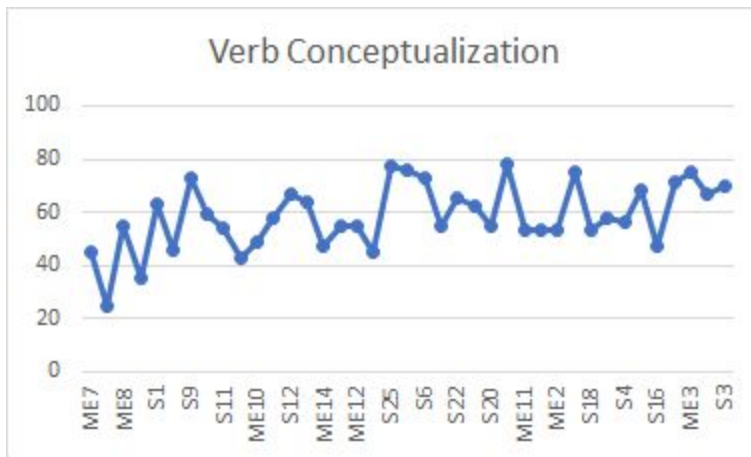
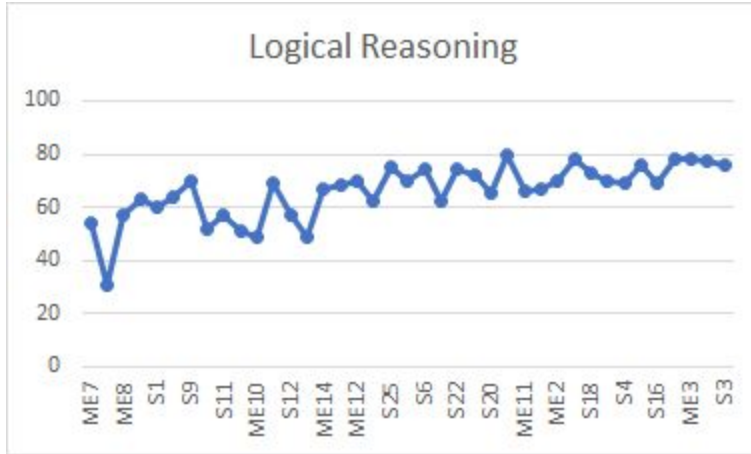


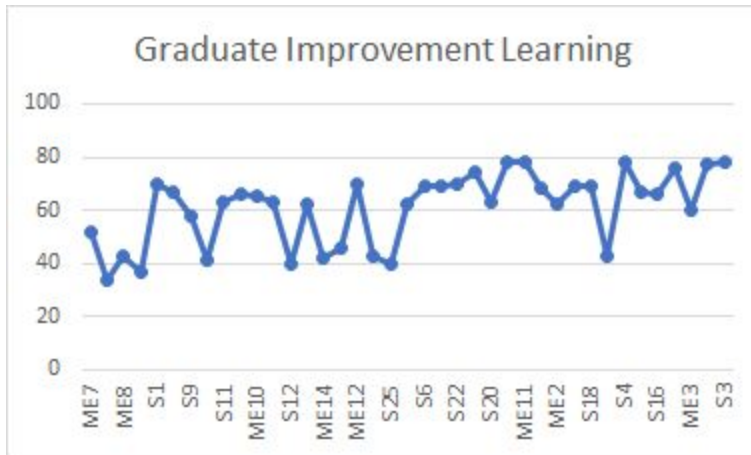
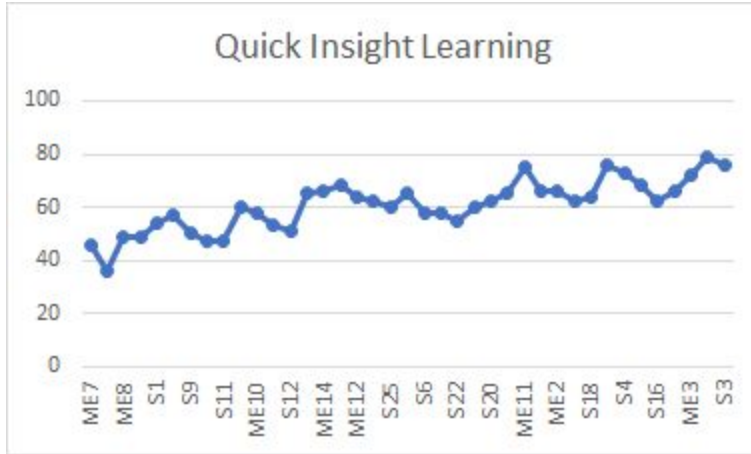
Line graphs for information processing competencies. Graphs are arranged in order of participants from Operational towards Strategic orientation











## Appendix D - Participant Background Questionnaire

The table below summarizes each question put to participants related to strategic thinking concepts on the participant background questionnaire, and notes which group in each category scores higher on average. Managers/Executives are assessed against students, and participants with Engineering against Non-Engineering backgrounds.

**Key:** *Where the cell is highlighted, this group scored themselves higher on average than the other group*

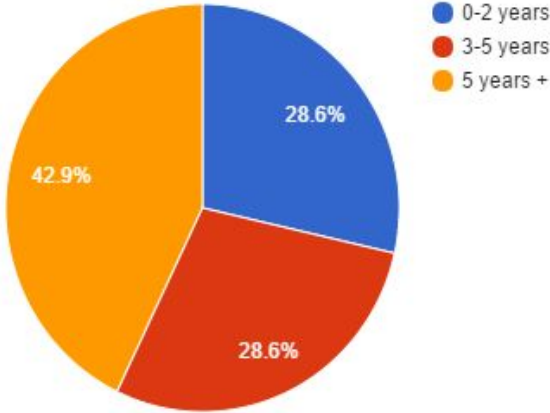
**Column 1:** Manager/Executive or Student

**Column 2:** Engineering or Non-Engineering

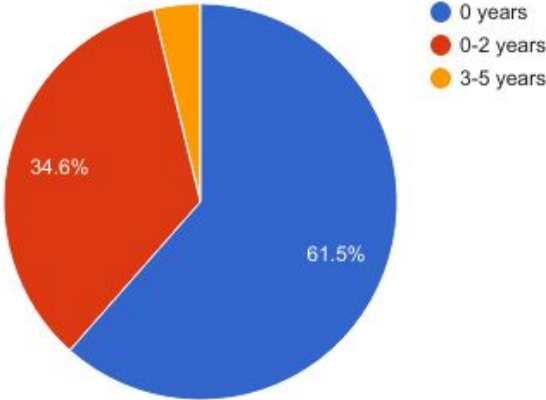
Question	Column 1	Column 2
To what extent do you consider yourself analytical?	Manager/Executive	Engineering
How creative are you?	Manager/Executive	Engineering
How important it is for you to use intuition in day to day life?	Manager/Executive	Engineering
Do you try to create visual images of where you want to be in the future?	Student	Engineering
Do you constantly seek information from multiple sources?	Student	Engineering
How important is thinking at an abstract level to you?	Manager/Executive	Engineering
How often do you make generalizations from what you observe?	Manager/Executive	Engineering
Do you ask a lot of questions?	Manager/Executive	Engineering
Do you believe in considering the interests of multiple stakeholders involved in a decision even if they have contrasting opinions to yours?	Manager/Executive	Engineering
To what extent do you challenge the status quo or underlying beliefs and assumptions?	Manager/Executive	Engineering
Do you always try to synthesize all the information available to you?	Student	Engineering
Do you spend a lot of time reflecting on both successful and unsuccessful outcomes?	Student	Engineering
Do you appreciate the perception of organization seen as a holistic system where systems behave, interact with their environment and influence each other?	Manager/Executive	Engineering

Pie charts representing work experience in number of years for both students and managers, combined and separately.

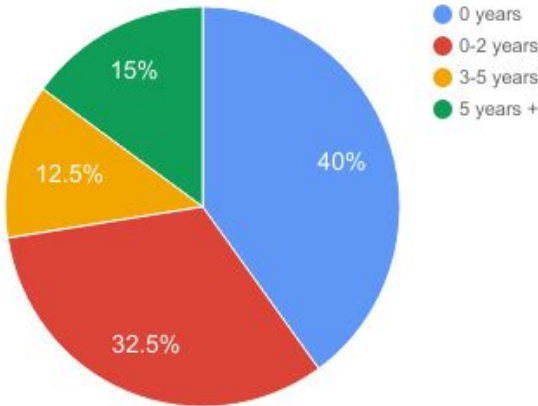
**Managerial/Executive Work Experience:  
Managers/Executives**



**Managerial/Executive Work Experience:  
Students**

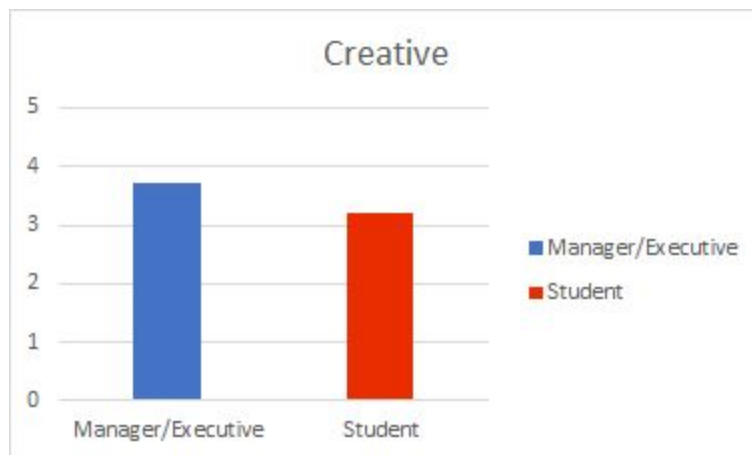
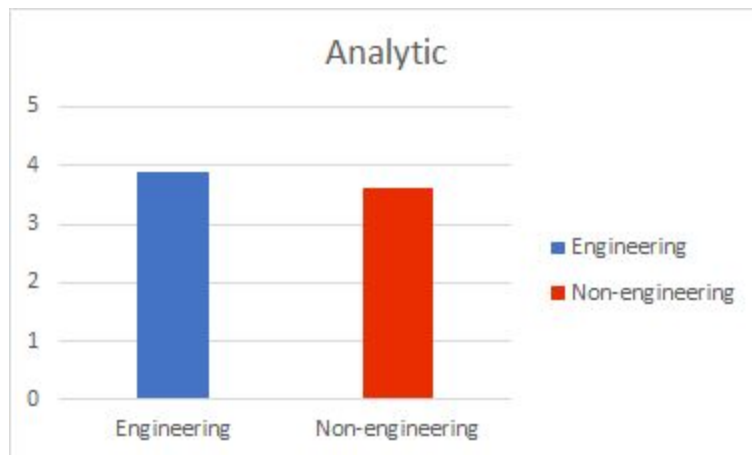
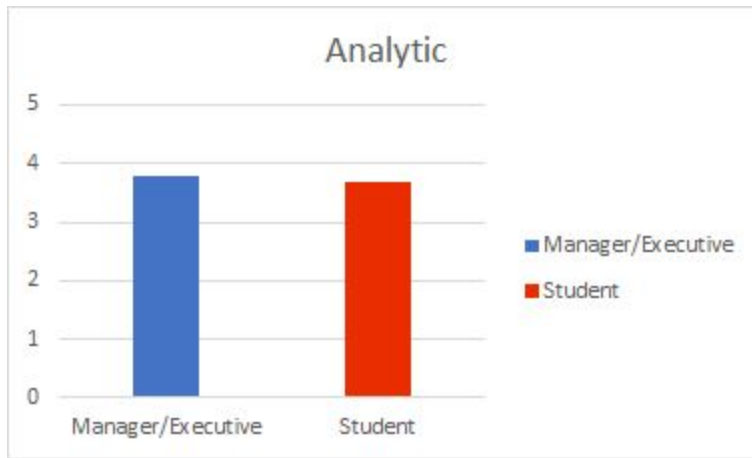


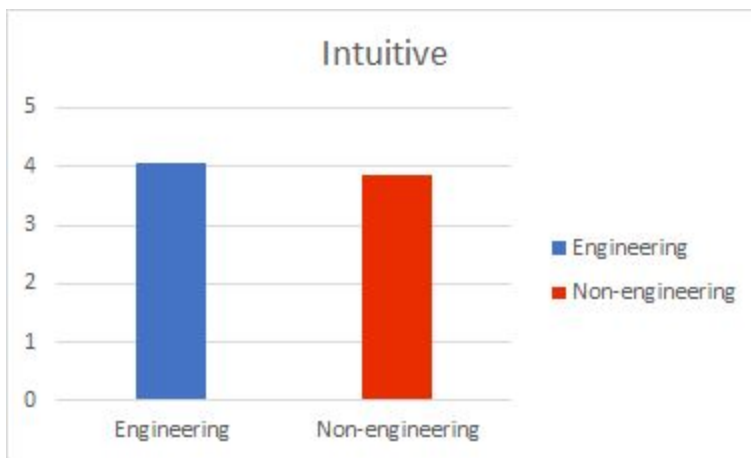
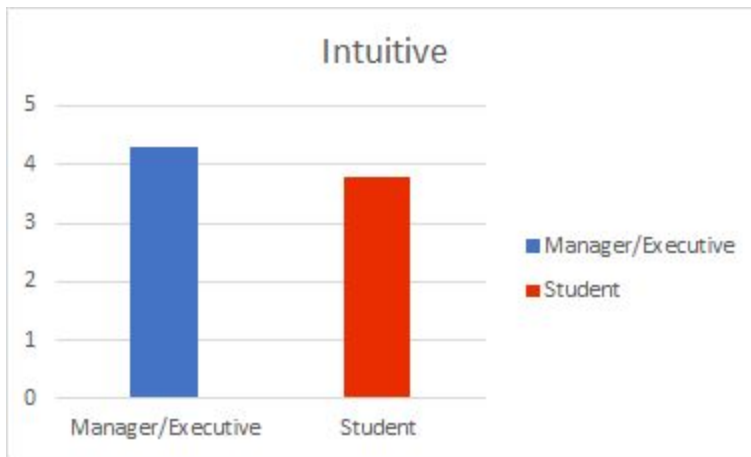
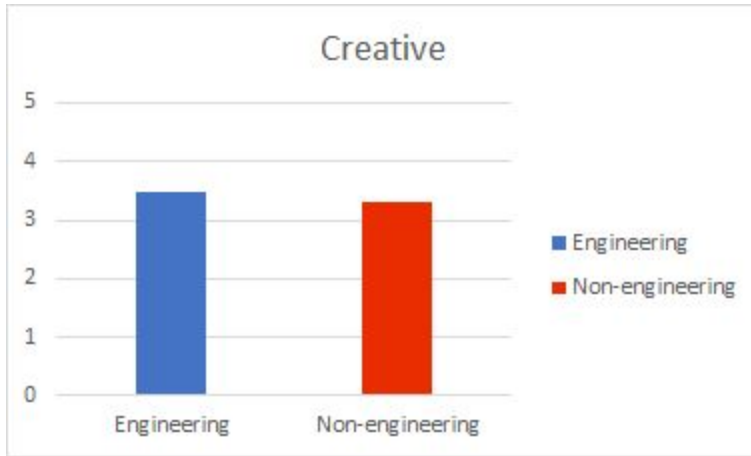
**Managerial/Executive Experience of  
Participants**

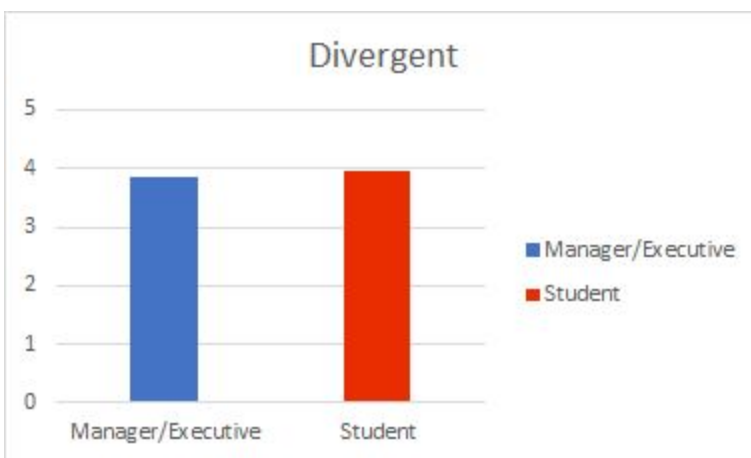
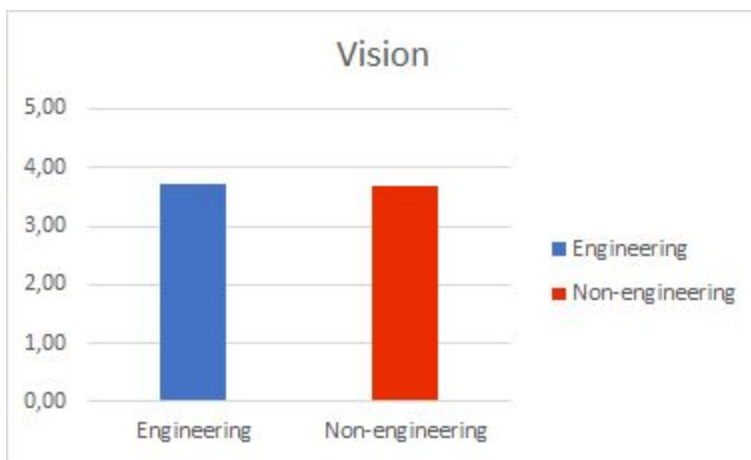
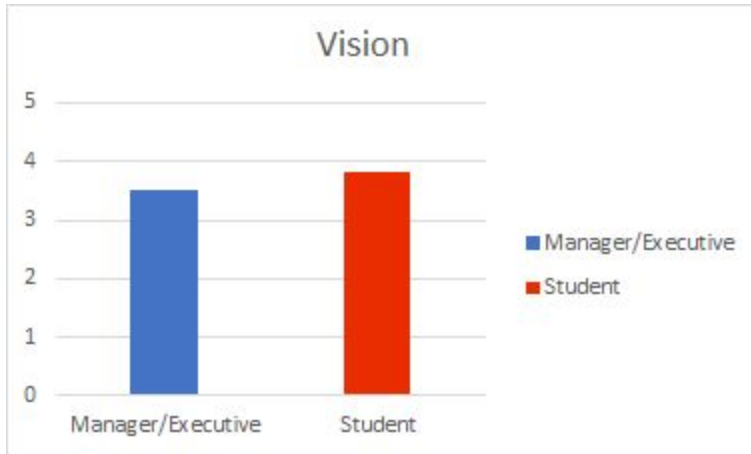


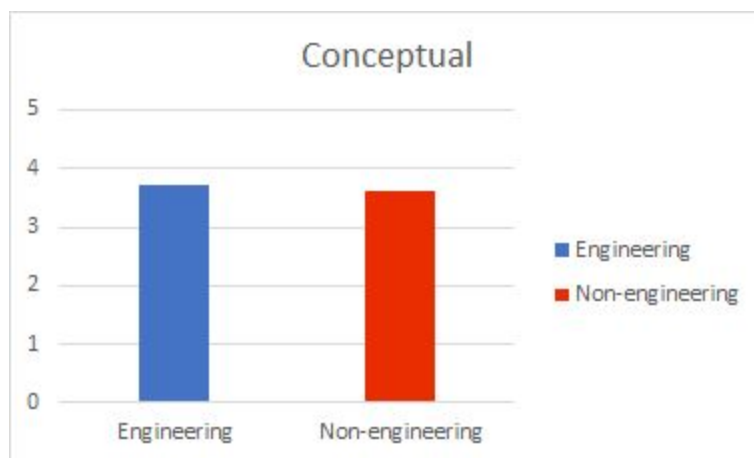
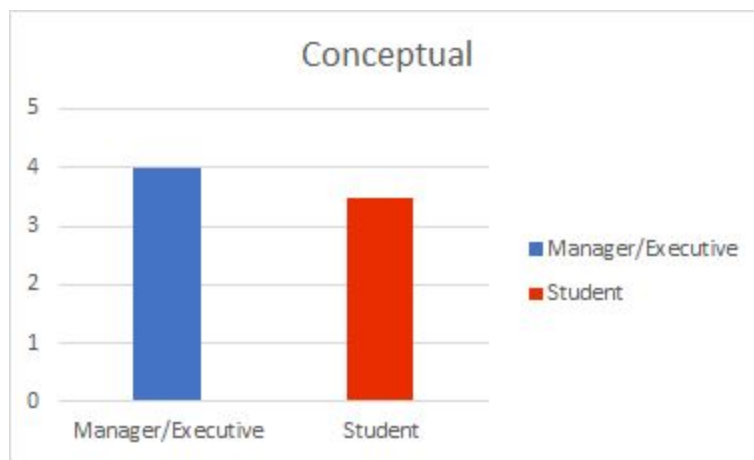
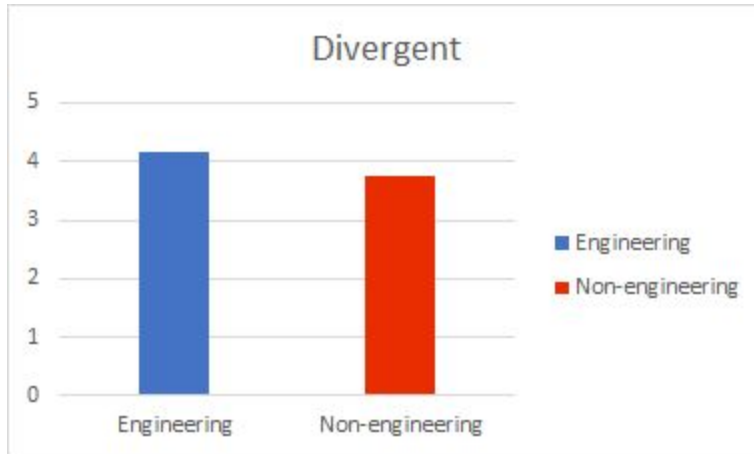


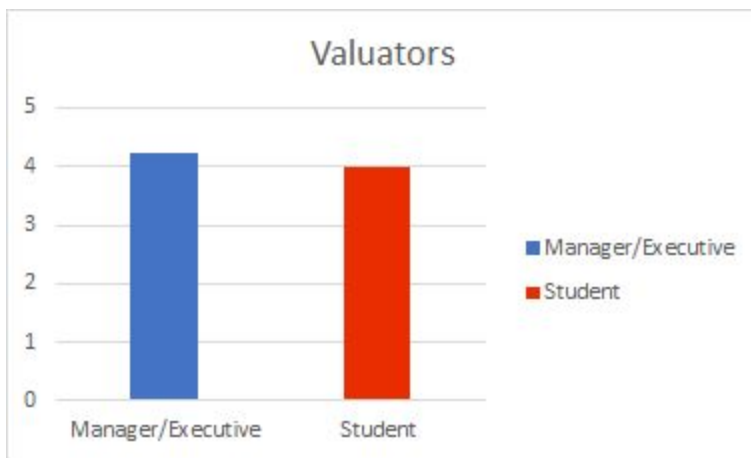
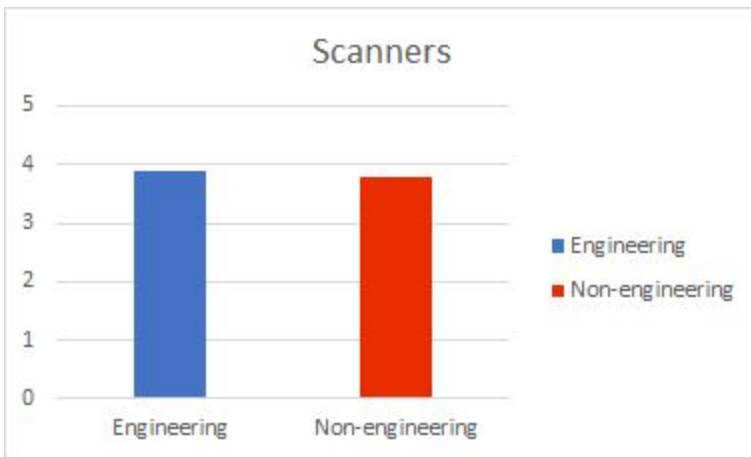
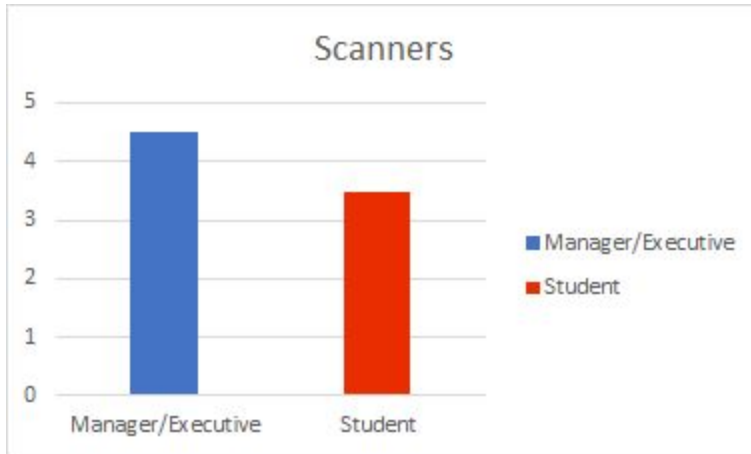
## Appendix D -Participant Background Questionnaire graphs

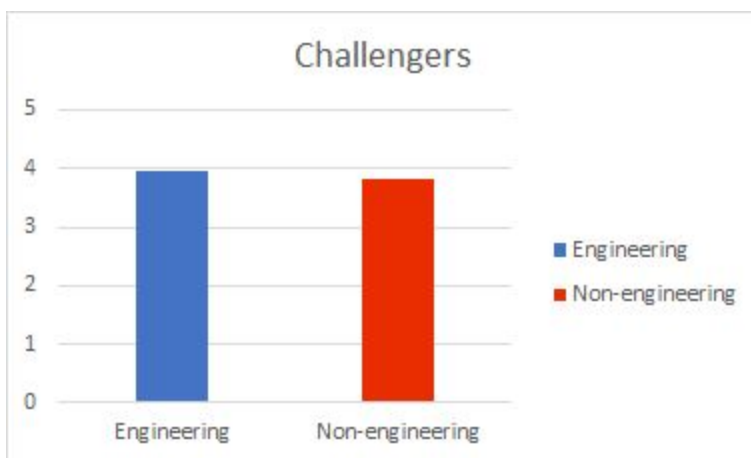
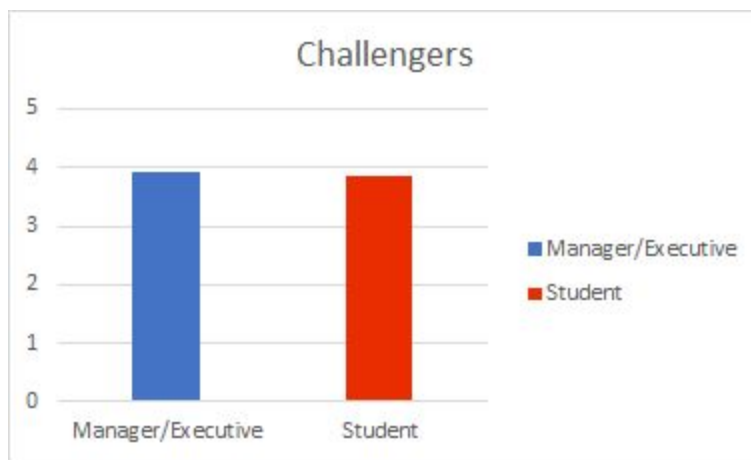
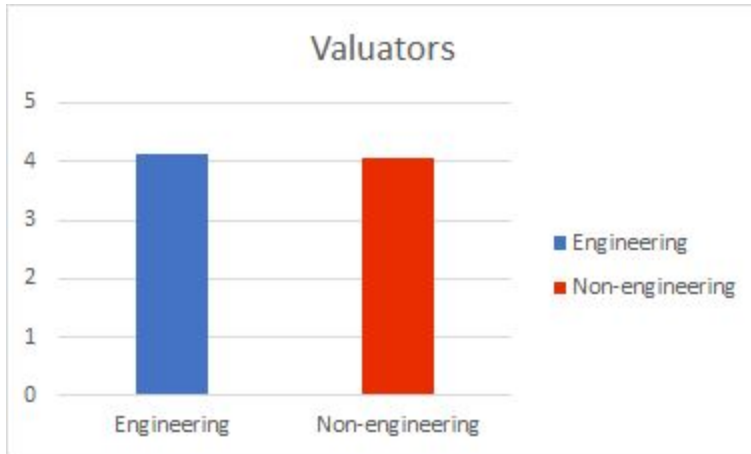


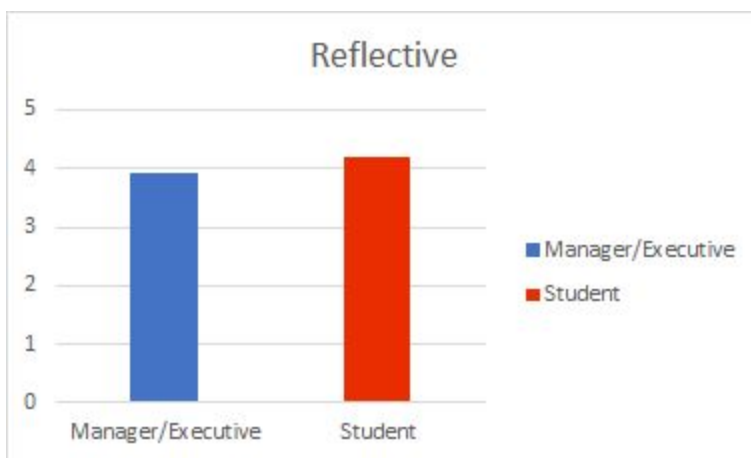
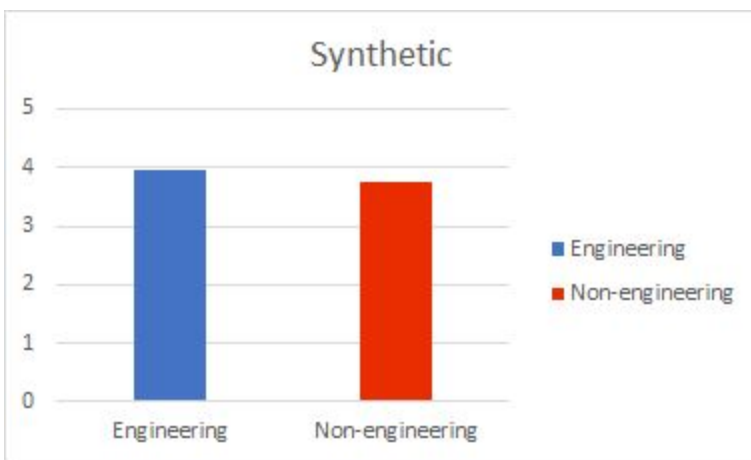
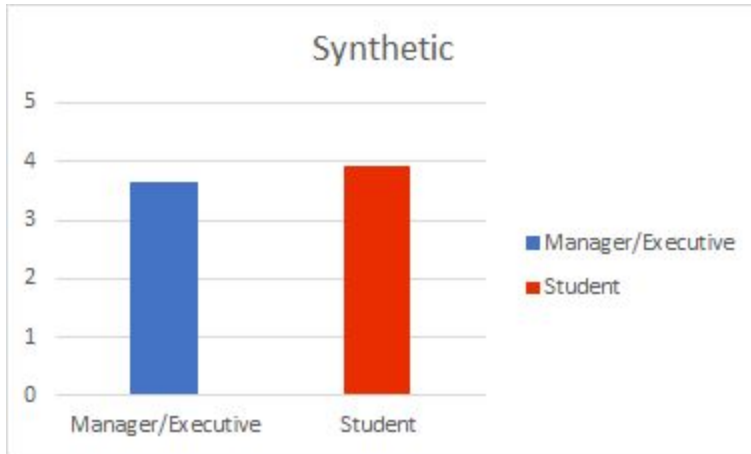


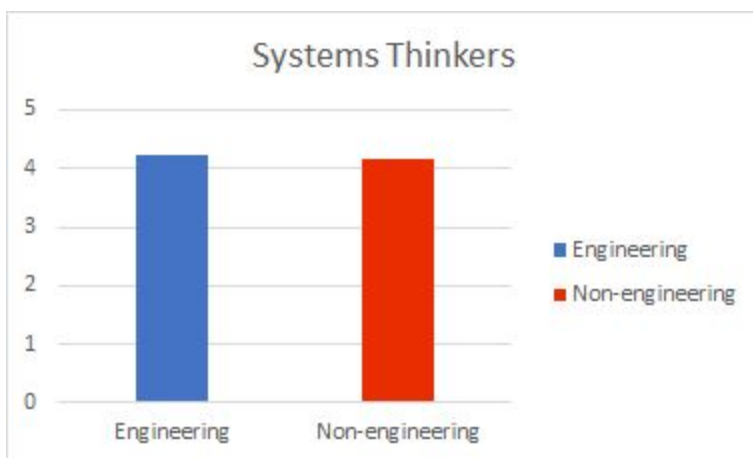
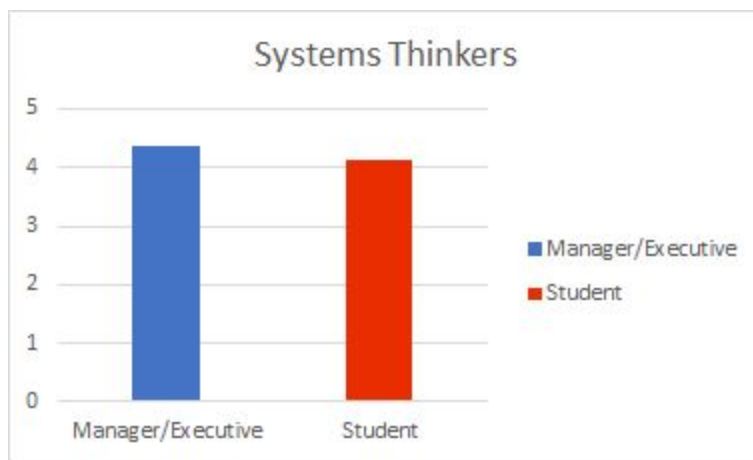
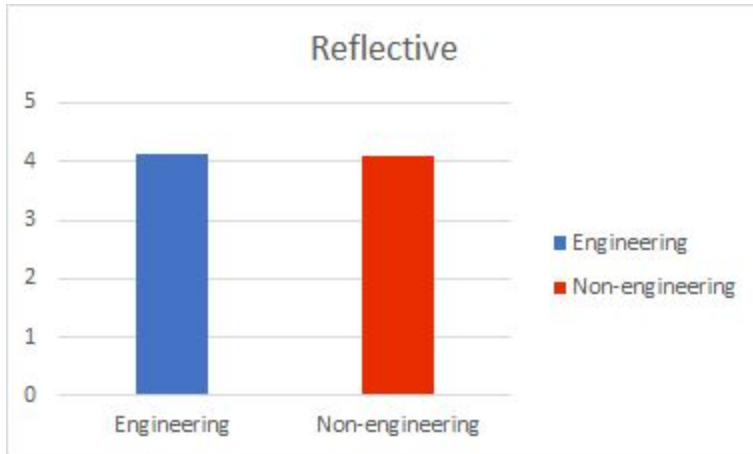




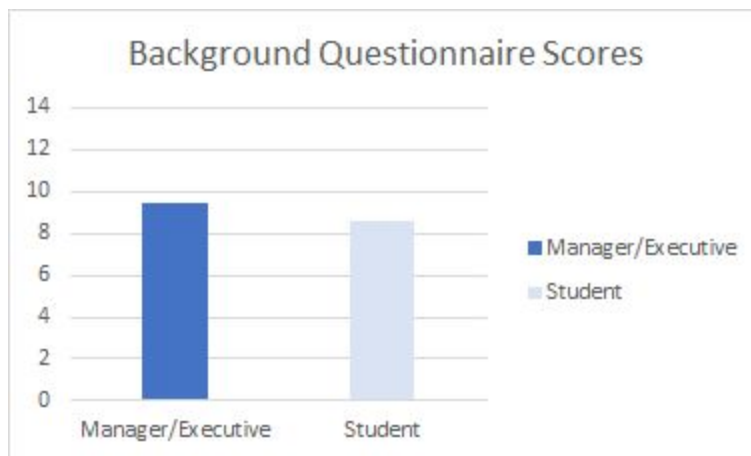
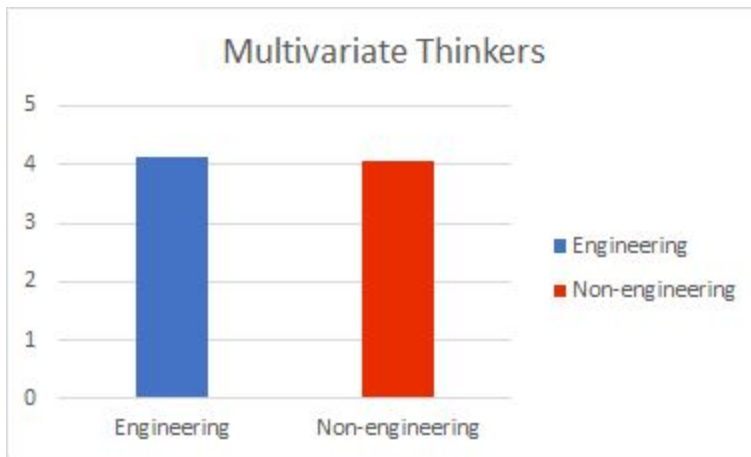
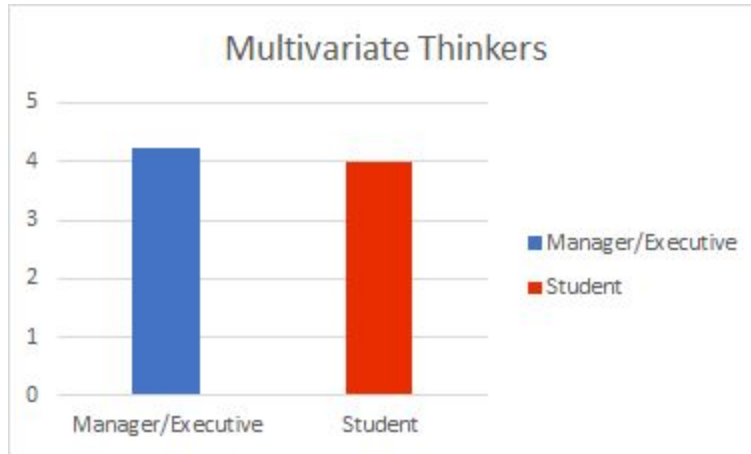


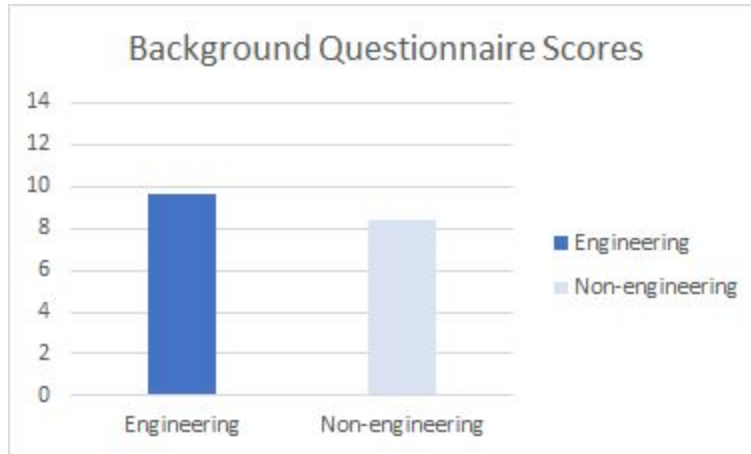












**Appendix E - Table containing data for Cross-Analysis from Questionnaires, CPP assessments and Interviews.**

S stands for Students

ME stands for Managers/Executives

<b>Student &amp; Managers /Executives</b> <i>(S'x' indicates student and ME 'x' indicates Managers/Executives)</i>	<b>Questionnaire Score Full Version</b> <i>(Out of /13)</i>	<b>Updated Questionnaire Score</b> <i>(Omitting Game Theory and Intuition)</i>	<b>CPP Score (Combined Current and Potential Work Environment)</b> <i>(Out of /5)</i>	<b>Interview Score Full Version</b> <i>(Out of /48)</i>	<b>Updated Interview Score</b> <i>(Omitting Experience, Games Theory, Intuition &amp; Systems Thinking,)</i>
<b>S1</b>	11	9	2.5	37	25
<b>S2</b>	10	8	2.5	32	23
<b>S3</b>	7	6	4.5	35	29
<b>S4</b>	9	8	4	31	24
<b>S5</b>	9	7	4.5	30	24
<b>S6</b>	9	8	3.5	26	18
<b>S7</b>	7	5	2.5	38	25
<b>S8</b>	12	10	4	37	27
<b>ME1</b>	12	11	4	30	22
<b>ME2</b>	10	8	4	36	28
<b>ME3</b>	10	8	4.5	36	26
<b>ME4</b>	7	5	2	28	20
<b>ME5</b>	8	7	4	36	24
<b>ME6</b>	11	9	3	37	26