

UNIVERSITÀ  
DEGLI STUDI  
DI PADOVA

PhD in Economics and Management  
Management Curriculum  
31<sup>st</sup> Cycle

Department of Economics and Management,  
University of Padova

Managerial and Operational Problem-Solving: From Micro-  
Foundations to Antecedents of Behavior Modes

Head of the PhD Program: Prof. Antonio Nicolo

Supervisor: Prof. Andrea Furlan

PhD Candidate: Matin Mohaghegh

## **Acknowledgment**

It is my proud privilege to release the feeling of my gratitude to people who directly or indirectly have lent their hand in this venture and helped me conduct this research work. Without their continued efforts and support, I would have not been able to bring my work to a successful completion.

This dissertation could not be written to its fullest without Prof. Andrea Furlan, who served as my supervisor, as well as one who challenged and encouraged me during the time I was working with him. He would have never accepted anything less than my best efforts. He was extremely helpful to get along with this work. I deeply believe that now I am a better researcher due to the way I have been trained under his valuable supervision and guidance. For his time, energy and all the support he showed during all three years of my PhD, I thank him.

I would also like to express my sincere gratitude to Prof. Andreas Größler, who generously provided me the opportunity to spend 4 months as a research visitor in Department of Operations Management, University of Stuttgart. I am extremely thankful and indebted to him for sharing expertise, sincere and valuable guidance and encouragement extended to me and the work especially in times of need.

I want to express my deepest appreciation to university of Padova and every single one in the Department of Economics and Management who made my journey so pleasant. I Thank them for their help, support and more importantly the opportunity provided for me to learn from top scholars and exchange ideas with international students in a multidisciplinary and culturally divers atmosphere.

I should thank my friends and family who always stood by me in good and bad times here in Italy, Back home in Iran, and the ones spread in the world. Their names cannot be disclosed by but

I'd like to acknowledge and appreciate their permanent support and encouragements. No matter how far they were, I always have them by my side.

Last but not the least I would like to express my heart full indebtedness and owe a deep sense of gratitude to my parents, Morteza and Maryam, whose love and support moved me through all the steps of my life from day one till now and also this work. I doubt that I will ever be able to convey my appreciation fully to them. They never let me feel alone while I was miles away from home.

However, this work is heartily dedicated to them as they gave meaning to everything I have in life. I also take this opportunity to give thanks to my brother, Mahan, for his unceasing love, support and encouragement. I've never felt weak by having them in my life.

Matin Mohaghegh

September 2018 – Padova - Italy

## Table of Contents

Thesis Introduction .....	5
<b>Analytical Problem-Solving, More Recommended than Used: A Synthesis of the Literature .....</b>	<b>10</b>
1. Introduction.....	10
2. Analytical Problem-Solving: Definition & Characteristics .....	15
3. Research Methodology .....	17
3.1 Selection of Source Documents.....	17
3.2 Retrieval of Co-Citation Matrix .....	20
3.3 Results of Co-Citation Analysis .....	23
4. Cross-Cluster Analysis.....	27
4.1 Internal Factors .....	29
4.2 An External Factor: Environmental Dynamism .....	36
5. Discussion .....	38
6. Conclusion .....	43
7. References.....	44
<b>The Dynamics of Operational Problem-Solving: A Dual-Process Approach .....</b>	<b>52</b>
1. Introduction.....	52
2. Case study: Operational Problem-Solving in Practice .....	57
3. Structural Building Blocks of Problem-Solving Modes .....	64
3.1 Intuitive Problem-Solving (IPS).....	64
3.2 Analytical Problem-Solving (APS) .....	68
4. Dynamics of Behavior Modes and Transition between Modes .....	72
4.1 IPS Adoption .....	72
4.2 APS Adoption.....	74
4.3 An Integrated Model: Scenarios To Investigate IPS Dominance .....	75
4.4 Simultaneous Adoption of IPS and APS .....	80
5. Discussion .....	81
6. Conclusion .....	84
7. References.....	85
Appendix A.....	89
Appendix B .....	92
<b>CEO's Analytical Problem-Solving and Psychological Determinants of Success: Evidence from Iran ....</b>	<b>95</b>
1. Introduction.....	95
2. Literature Review.....	102
2.1 Positive Psychological Traits.....	102

2.2 Analytical Problem-Solving .....	104
3. Theoretical Developmet & Hypotheses Development .....	105
3.1 Positive Psychological Traits and APS .....	105
3.2 APS of CEO and Organizational Performance.....	108
4. Research Method .....	110
4.1 Sample .....	110
4.2 Procedure.....	114
4.3 Measures.....	116
5. Research Analysis and Results .....	121
5.1 Common Method Bias (CMB) .....	121
5.2 Measurement Model.....	124
5.3 Structural Model.....	127
5.4 Additional Analysis .....	130
6. Discussion.....	133
6.1 Theoretical Implication.....	135
6.2 Managerial Implication.....	136
7. Conclusion .....	137
8. References.....	139
Appendix.....	145
Thesis Conclusion.....	151

# Thesis Introduction

My PhD dissertation includes three papers to deal with complex problems either at shop-floor level, called *operational problem-solving*, or at upper-management level of the organization, known as *managerial problem-solving*. However, this research makes a very clear distinction between either fixing a problem by just eliminating its symptoms or overcoming it through diagnosing and altering underlying causes. Drawn from dual-process theory (Evans & Stanovich, 2013), the former is based on intuitive reasoning of individuals (called Intuitive Problem-Solving: IPS) with minimum cognitive efforts, whereby problem-solvers jump to a solution using prompt remedies, short-term fixes and heuristics to temporarily solve the problem. The latter, conversely, relies on analytical reasoning of individuals (called Analytical Problem-Solving: APS) with deliberate and reflective cognitive efforts to overcome the problem fundamentally using a set of structured actions. However, an analytical problem-solver is required to go through a series of stages for a comprehensive problem formulation (i.e. problem definition, problem analysis, and solution design) before the final decision is reached (e.g. Astor et al., 2016; Schwenk, 1995; Smith, 1989; Mintzberg et al., 1976).

Although the effectiveness of APS, as a superior behavior mode, is asserted in the management literature as a way to fundamentally solve the problems, contribute to strategic capabilities (i.e. organizational learning and continuous improvement) and ameliorate the long-term performance (Baer et al., 2013; Repenning & Sterman, 2002; Tucker et al., 2002; Tucker & Edmondson, 2003), little attention is placed to articulate the main supporting factors of this superior behavior mode, and thus existing literature fails to highlight the conditions through which APS pays off successfully. Moreover, many firms fail to implement this behavior mode or struggle to fully reap its benefits at both operational and strategic domains. So, in the first paper of my thesis, a

systematic literature review (SLR), coupled with a document co-citation analysis, is conducted to discover the APS supporting factors as well as the enabling conditions through which APS is more likely to succeed. Based on a synthesis of the literature, three groups of (a) organizational, (b) environmental, and (c) problem nature-related factors are discussed in order to gain the most out of this behavior mode for in the context of both operational and managerial problem-solving.

Second paper, motivated by a field-work at a manufacturing firm, studies the micro-foundations of each behavior mode in the context of *operational problem-solving*. Based on insights from the case-study conducted, IPS and APS, as two potential solutions to approach and respond to the problems, are unpacked by explication of key variables as well as the relationships among them. Moreover, despite the key role of the APS, problem-solvers are more likely to adopt IPS, a phenomenon that is called "*IPS dominance*" in the literature (Baer et al., 2013; Tucker & Edmondson, 2003; Tucker et al., 2002; Repenning & Sterman, 2002). In this paper, a system dynamic modeling is developed whose simulation results illustrate the transition dynamics between IPS and APS to shed light on the mechanisms through which "*IPS dominance*" occurs in the context of operational problem-solving. (1) Problem urgency due to time pressure, (2) managers with short-term horizon and (3) insufficient attention to establish and maintain a set of organizational antecedents for a successful APS adoption, emerge as three main reasons that cause IPS to take precedence over APS. Finally, this study concludes that a combination of IPS and APS (i.e. adopting both behaviors simultaneously with an emphasis on APS though) could be recognized as the best strategy for problem resolution. In this regard, IPS should be encouraged to prevent the situation from getting worse and keep the production running even in a suboptimal way, and APS, simultaneously, to solve the problems fundamentally with a less probability for the problems to recur.

APS can also be adopted at the *strategic level* of the firm where upper-echelon executives are required to employ a rational-comprehensive behavior while making strategic decisions (Miller, 2008; Elbanna & Child, 2007; Hough & White, 2003; Fredrickson, 1984). Hence, in the third chapter, the attention is moved from the operational or shop-floor level to upper-management or strategic level of the organization. I argue that every single behavior thus including problem-solving behavior of CEOs is subject to the psychology in which they perceive things. However, unlike most of behavioral studies in management literature that focus on human dysfunctions and failures at the workplace (Peterson & Luthans, 2003; Luthans et al., 2005; Luthans, 2002), this study places more attention on *positivism*. More precisely, the third paper empirically investigates the relationships between CEO's positivism in particular hope, optimism and resiliency, APS, and the firm-level performance. Based on cross-sectional data using a structural equation modeling (SEM), positively-oriented human traits (i.e. hope and resiliency) are introduced as the psychological antecedents of APS that are, in turn, influential for organizational performance.

In my dissertation, I do not present novel tools and techniques for problem-solving. Instead, I adopt different theories from other research streams to scrutinize problem-solving behavior modes. For instance, in the second paper, I employ a well-known perspective in organizational studies (i.e. organizational learning), to study the micro-foundations of each mode. In the third chapter, emphasizing APS, I borrow variables from psychology (i.e. personality traits) and couple them with APS to investigate the psychological antecedents of APS, at strategic level of the firm. This attitude assists me to effectively bridge the gap between different management streams such as organizational behavior, strategic management, and operations management since I deeply believe in interdisciplinary areas as the upcoming trends in management studies.

All in all, my PhD thesis consists primarily of three papers as follows:

- 1) Analytical Problem-Solving, More Recommended than used: A Synthesis of the Literature
- 2) The Dynamics of Operational Problem-Solving: A Dual-Process Approach
- 3) CEO's Problem-Solving and Psychological Determinants of Success: Evidence from Iran

This first paper, together with Prof. Andrea Furlan, is presented in *18<sup>th</sup> conference of European Academy of Management (EURAM)*, 19-22 of June, 2017 in Reykjavik, Iceland.

The second paper, as a joint work with Prof. Andreas Groessler, has been presented in *25<sup>th</sup> international conference of European Operations Management Association (EurOMA)*, 24-26 of June, 2017 in Budapest, Hungary.

## References

- Astor, T., Morales, M., & Repenning, N. (2016). What problem are you trying to solve: An introduction to structured problem solving. *MIT Sloan School of Management, Working Paper*.
- Baer, M., Dirks, K., T., & Nickerson, J., A. (2013). Microfoundations of strategic problem formulation. *Strategic Management Journal, 34*, 197–214.
- Choo, A. S., Nag, R., & Xia, Y. (2015). The role of executive problem solving in knowledge accumulation and manufacturing improvements. *Journal of Operations Management, 36*, 63–74.
- Elbanna, S., & Child, J. (2007). The influence of decision, environmental and firm characteristics on the rationality of strategic decision-making. *Journal of Management Studies, 44*(4), 561–591.
- Fredrickson, J. W. (1984). The comprehensiveness of strategic decision processes: Extension, Observations, Future Directions. *Academy of Management Journal, 27*(3), 445–466.
- Hough, J. R., & White, M. A. (2003). Environmental dynamism and strategic decision-making rationality: An examination at the decision level. *Strategic Management Journal, 24*(5), 481–489.
- Luthans, F., Avolio, B. J., Walumbwa, F. O., & Li, W. (2005). The psychological capital of Chinese workers : Exploring the relationship with performance. *Management and Organization Review, 1*(2), 249–271.
- Miller, C. C. (2008). Decisional comprehensiveness and firm performance: Towards a more complete Understanding. *Journal of Behavioral Decision Making, 21*, 598–620.
- Peterson, S. J., & Luthans, F. (2003). The positive impact and development of hopeful leaders. *Leadership & Organization Development Journal, 24*(1), 26–31.
- Repenning, N. P., & Sterman, J. D. (2002). Capability traps and self-confirming attribution errors in the dynamics of process improvement. *Administrative Science Quarterly, 47*(2), 265–295.
- Tucker, A. L., Edmondson, A. C., & Spear, S. (2002). When problem solving prevents organizational learning. *Journal of Organizational Change Management, 15*(2), 122–137.

# Analytical Problem-Solving, More Recommended than Used: A Synthesis of the Literature<sup>1</sup>

**Abstract-** Problem-solving long has been recognized as the heart of maintaining or improving business outputs. However, not every problem-solving behavior contributes to long-term performance of firm. Problem-solving research has devoted attention on a behavior mode that relies on analytical reasoning of individuals to comprehensively formulate a problem. Drawing from dual-process theory, this behavior mode, requires deliberate and reflective cognitive efforts though, is labeled as analytical problem-solving (APS). In order to explore the scope of this mode and discover the core clusters in which APS is recommended, first, a systematic literature review (SLR) is coupled with a bibliometric document co-citation analysis. Moreover, despite the effectiveness of APS that is widely-asserted in management literature, an inclusive analysis is lacking to identify the circumstances under which problem-solvers can fully reap the benefits of this behavior mode. Therefore, based on a cross-cluster analysis, we demonstrate a set of supporting factors for APS adoption as well as the enabling conditions through which this behavior mode could successfully pay off, at both shop-floor and upper-management level of the organization.

**Keywords-** Analytical Problem-Solving, Cognitive Perspective, Systematic Literature Review

## 1. Introduction

In today's competitive environment, in which organizations are striving in the face of increasing pace and business complexity, a key point to survival is the ability of firms to quickly respond to changes, and constantly seeking continuous improvement and organizational learning. One way to advance these capabilities is nurturing individuals skills of problem-solving (Astor et al., 2016; Choo et al., 2015; Gray, 2001; Tucker et al., 2002, 2001; Mac Duffie, 1997; Garvin, 1993; Beer et

---

<sup>1</sup> Mohaghegh, M. & Furlan, A. "Analytical Problem-Solving, More Recommended than Used: A Synthesis of the Literature". *18th European Academy of Management (EURAM) Conference*, 19-22 June, 2018, Reykjavik.

al., 1990). People and also organizations learn from addressing problems and solving them. However, there is a considerable consensus among researchers that not every problem-solving activity leads to improved performance and sustainable success. Research on problem-solving makes a clear distinction between either fixing a problem by just removing its symptoms or overcoming it through diagnosing and altering underlying causes (Morrison, 2015; Choo et al., 2015; Repenning & Sterman, 2002; Tucker et al., 2002). In this study, we define problem-solving as a pattern of individual behaviors aimed at solving a problem either at operational or strategic level of the organization and also distinguish between two behavior modes, or simply two distinct cognitive approaches, to problem-solving. Drawing from dual-process theory (Evans & Stanovich, 2013), one behavior mode is based on intuitive reasoning of individuals to employ short-term remedies, prompt fixes, and heuristics to temporarily solve the problem. Intuitive problem-solvers look for the most satisfactory solution with minimal cognitive efforts. This occurs by reducing the negative effects of a problem while neglecting its root-causes. The other mode, conversely, relies on analytical reasoning of individuals to solve the problem fundamentally using a set of structured actions. To do so, analytical problem-solvers are required to go through a series of stages for problem formulation (i.e. problem definition, problem analysis, and solution design) before implementing the best applicable solution. We label these behavior modes as intuitive problem-solving (IPS hereafter) and analytical problem-solving (APS hereafter), respectively. We use these two terms for two main reasons.

First, despite a clear separation between the two behavior modes, there are no commonly used terms for them in the literature. As a matter of fact, literature uses a plethora of terms to indicate different problem-solving modes such as first-order and second-order problem-solving (Tucker et al., 2002), symptomatic and generative problem-solving (Choo et al., 2015), first-order and

second-order improvements (Repenning & Sterman, 2002), front-line mechanism, i.e. workarounds, and managerial intervention, i.e. resource allocation (Morrison, 2015), single loop and double loop learning (Argyris, 1976), amateur and professional problem-solving (Donaldson, 1972), and incrementalism and rationality (Priem et al., 1995; Schwenk, 1995).

Second, IPS and APS, as the words imply, provide a clear explanation regarding the nature of each behavior mode from a cognitive perspective. APS refers to a behavior mode which is based on individual's analytical skills and logical reasoning that leads to a more appropriate solution whereas IPS activates individual's intuition as the basic cognitive processing to react quickly to the problem.

Although the effectiveness of APS, as a way to fundamentally solve the problems, contribute to strategic capabilities (i.e. organizational learning and continuous improvement) and ameliorate the long-term performance of the firm is well-highlighted in the management literature, little attention is placed to articulate the main supporting factors of this superior behavior mode, and thus existing literature fails to highlight the conditions through which APS could perform effectively. Inadequate attention to these factors (and conditions) curbs APS adoption and eventually results in a higher tendency for IPS, a phenomenon called "*IPS dominance*" (Baer et al., 2013; Tucker & Edmondson, 2003; Tucker et al., 2002; Repenning & Sterman, 2002). As a consequence of IPS adoption, organizations fail to fully reap the benefits of improvement-based programs (e.g. lean manufacturing and its bundles such as just in time or total quality management) at operational level or strive to make rational and analytical strategic decisions. Motivated by the gap in problem-solving literature, this paper presents a systematic literature review (SLR) whereby a synthesis of the relevant studies sheds light to discover the supporting factors of APS and the

enabling conditions through which this behavior mode is more likely to succeed in operational as well as strategic domains.

Since we address both operational problems and managerial decisions, the SLR is focused on a wide spectrum of literature ranging from operations management to strategic management. First, using a document co-citation analysis, we determine (1) problem formulation and (2) strategic decision making as the core clusters in which APS is emphasized. We demonstrate that, APS is stressed not only as a behavior mode to solve the problems fundamentally but also seems vital for strategic decision making for the long-term success. In both clusters, APS is recommended as the behavior mode to gather rich information regarding the major problem and its key drivers. As a matter of fact, APS adoption assists problem-solvers (or decision makers) to mitigate the uncertainty regarding the problem (or decision). Synthesis of the literature reveals that there are two contributors for the perceived uncertainty. One is internal uncertainty that is related to the nature of the problem. Ill-structured problems are characterized by the high level of complexity and ambiguity. For this type of problems (i.e. strategic decisions or complex and non-routine operational problems), APS, with an emphasis on rich information collection, is suggested to structure the problem and mitigate the internal uncertainty. The second source of uncertainty, called external or environmental uncertainty, refers to high environmental dynamism that is characterized by sudden changes in customers' requirements, high technological development, and intense competition. High-velocity environments also raise the necessity of APS for minimizing the external uncertainty and achieving the better decisions consequently.

Drawing on cognitive limitation of individuals, we illustrate that mitigation of both internal and external uncertainty does matter for the successful implementation of problem-solving. Indeed, when the level of uncertainty is high, problem-solvers solely rely on their existing hypotheses and

previous experiences. As a consequence, the analytical mode of individuals (i.e. APS adoption) is narrowed and problem-solving is limited to jumping to a solution (i.e. IPS adoption). This is an instinctive reaction known as cognitive bias in information processing of individuals. According to the cross-cluster analysis, we conclude that in order to minimize the cognitive bias and encourage APS adoption for uncertainty reduction, a set of institutional factors is required. We address (a) time availability, (b) organizational resource access, (c) collaborative culture, (d) managerial awareness, and (e) learning infrastructure, call them APS organizational antecedents, necessary for ill-structured problems to be comprehensively formulated, and show how they contribute for the successful APS adoption.

Unlike many other efforts in problem-solving research, this study is not about presenting novel tools and techniques for APS. Instead, adopting a cognitive perspective, we study APS that is promoted at shop-floor and strategic level of the organization as a superior behavior mode and establish its supporting factors and enabling conditions. This paper contributes to several studies coming from different disciplines such as operations management, organizational behavior and strategic management where APS is highly recommended for high-quality decisions. By delineating the supporting factors that condition the successful APS, we clarify why many organizations fail or struggle to implement this behavior mode. Moreover, this study provides insightful information and guidelines to managers to deepen their understandings about the circumstances under which they can develop APS adoption (e.g. lean manufacturing, Six Sigma, strategic assessments).

The remainder of the paper proceeds as follows. In section 2, definitions, examples, and characteristics of APS are thoroughly discussed. Section 3 describes the review methodology in details, which is then followed by the research analysis and the main results in section 4. Section

5 discusses the main findings of the study. Finally, section 6 concludes with theoretical contributions, managerial implications, study limitations, and the directions to follow for the future studies.

## **2. Analytical Problem-Solving: Definition & Characteristics**

In terms of nature, problems vary from ill-structured to well-structured ones. Ill-structured problems are characterized by uncertainty, unknown and complex relationships for problem-solvers to deal with, whereas problems conceived of as well-structured are the ones with complete information that, in turn, can be explicitly formulated and quantified to solve (Ellspermann et al., 2006; Büyükdamgaci, 2003; Smith, 1988). Problem formulation following an analytical reasoning is emphasized to transform such ill-structured problems into well-structured ones, in a very logical way (Baer et al., 2013; De Mast & Lokkerbol, 2012; Mac Duffie, 1997). However, doing so requires deliberate and reflective efforts of problem-solvers. From a cognitive perspective, APS is based on analytical reasoning and logical framework to solve the problem fundamentally using a set of structured actions. Unlike Intuitive problem-solving (IPS) that is characterized by shortcuts, heuristics and short-term remedies, i.e. jumping to the solution with minimum cognitive efforts (e.g. Baer et al., 2013; Schroeder et al., 2008; Lyles & Mitroff, 1980), APS assumes a stepwise process to link the observed problem to a diagnosis, and eventually an appropriate solution through a systematic search strategy (Astor et al., 2016; Schwenk, 1995; Smith, 1989; Mintzberg et al., 1976).

We identify different terms representing APS in the management literature. In strategic management, scholars often use the term “strategic problem formulation” to indicate a logical behavior which encompasses steps of generation, evaluation, and selection of alternative solutions (Baer et al., 2013; Volkema, 1986; Ramaprasad & Mitroff, 1984). Authors mainly stress

“rationality” (Elbanna & Child, 2007; Hough & White, 2003; Priem et al., 1995), as well as “comprehensiveness” (Heavey et al., 2009; Miller, 2008; Miller et al., 1998; Fredrickson & Mitchell, 1984) as the most substantial characteristic of this behavior mode.

APS is also widely-studied in operations management literature where different tools and techniques are proposed to structure of problem-solving process. DMAIC (Define, Measure, Analyze, Improve, Control) in Six Sigma (Easton & Rosenzweig, 2012; Schroeder et al., 2008), emerging from famous Deming’s PDCA cycle is one of the most common approach to systematically improve operational processes.

All in all, the effectiveness of APS is well-established in the literature. It is directly associated with quality of solutions and decisions made (Helfat & Peteraf, 2015; Baer et al., 2013; Gray, 2001; Lyles & Thomas, 1988), operational improvements such as defects reduction and productivity enhancement (Marksberry et al., 2011; Longenecker et al., 1994) and, ultimately, with firm level performance (Marksberry et al., 2011; Schroeder et al., 2008; Volkema & Coraian, 1998). Moreover, researchers recognize it as the major trigger of strategic capabilities such as continuous improvement and organizational learning (Astor et al., 2016; Choo et al., 2015; Tucker et al., 2002; Schroeder et al., 2008; Spear & Bowen, 1999). For instance, Repenning and Sterman (2002) emphasize how first-order improvements, achieved through a systematic approach to problem solving, extract more usable output from existing processes rather than just removing the problem symptoms. Based on this behavior mode, problem-solvers view problems as the opportunities to learn rather than just liabilities to be avoided (Mac Duffie, 1997). This way of approaching the problem, from an organizational learning perspective, is known as “double-loop” learning (Argyris, 1976), where problem-solvers not only correct the problem fundamentally but also alter its underlying causes through a continual learning process (Choo et al., 2015).

### **3. Research Methodology**

To address our research question, i.e. what are the supporting factors of APS, a systematic literature review (SLR) was carried out. We followed a methodology suggested by Macpherson & Jones (2010) and Tranfield et al., (2003). The SLR, compared to traditional reviews, gives an opportunity to synthesize and organize the existing literature in a structured way (Wang & Chugh, 2014). However, the review began with a bibliometric document co-citation analysis as a strong, objective, and quantitative mean to explore the major clusters or research streams within the literature of the studied field (Nerur et al., 2008; Culnan, 1986).

We then used the co-citation matrix to identify different thematic clusters using a set of statistical analysis, comprising factor analysis (FA), multidimensional scaling (MDS), and cluster analysis (CA). Identifying the different clusters was deemed to be important since problem-solving is a widely-covered topic studied by different disciplines in management literature such as strategic management, organizational behavior, and operations management, just to name a few. Finally, by comparing the different studies in the different cluster, we identify the supporting factors of APS.

#### **3.1 Selection of Source Documents**

We obtained a collection of representative scientific papers through the keywords search in our SLR. We retrieved our data from Scopus as one of the world's leading citation databases of peer-reviewed literature. We searched for the terms in title, abstract, and keywords. The keywords, that to our understanding well-presented an analytical behavior in problem-solving, are: "structured problem-solving", "systematic problem-solving", "ill-structured problem-solving", "managerial problem-solving", and "operational problem-solving". We also add "strategic decision making" and "strategic problem formulation" to include all the articles in strategic management literature

where the term decision making is preferred to problem solving since it places emphasis on managers' decisions in shaping the strategy of the firm. The initial search included 1081 journal articles (grey literature such as books, and conference proceeding were excluded), confined in business, management, and accounting. No time intervention was imposed since we tended to study this behavior mode from its birth. Given such a large number of articles, sample size proceeded to be narrowed down by selection of only leading journals that are deemed to contribute more to the management literature (Danese et al., 2018; Söderlund & Borg, 2017). To do so, we ranked all the journals, offered by Scopus in our initial search, according to CiteScore<sup>2</sup>. Out of 80 different journals that contained articles with our desired keywords, we considered the first quarter (Q<sub>1</sub>) with the highest CiteScore. These Journals are: "Academy of Management Journal" (8.41), "Academy of Management Review" (7.50), "International Journal of Management Review" (6.86), "Journal of Management"(6.82), "Journal of Operations Management"(6.01), "Journal of International Business Studies" (6.00), "Journal of Cleaner Production" (5.83), "Administrative Science Quarterly" (5.83), "Strategic Management Journal" (5.82), "Academy of Management Perspective" (5.45), "Omega"(5.42), "Journal of Management Studies" (5.25), "Decision Support Systems"(4.67), "International Journal of Project Management" (4.58), "International Journal of Operations and Production Management"(4.41), "International Journal of Production Economics"(4.28), "Organization Science" (3.72), "Management Science" (3.62), "Technovation" (3.49), "Organization Studies" (3.27). This restriction resulted in 262 articles. To ensure that only relevant articles were included, we thoroughly investigated the abstracts as well the introductions and conclusions of the identified papers. Irrelevant papers were dropped out and we retained 139 qualified articles that just addressed an analytical behavior mode to cope with the

---

<sup>2</sup> CiteScore calculates the average number of citations received in a calendar year by all items published in that journal in the preceding three years.

problems. However, there might be other articles, necessary to fully explore APS, which still were not covered in the sample. Indeed, the SLR solely based on pre-determined searching rules may fail to identify all critical sources for the studied field. To overcome this limitation, we used a snowballing technique in order to identify more relevant articles and increase the reliability of the review (Greenhalgh & Peacock, 2005). As such, 52 more articles were added into our sample by reference tracking (i.e. pursuing references of references). Eventually, a total of 191 papers were recognized as the core set to proceed with co-citation analysis method. The sampling procedure with its sequence to be traced is outlined in Figure 1.

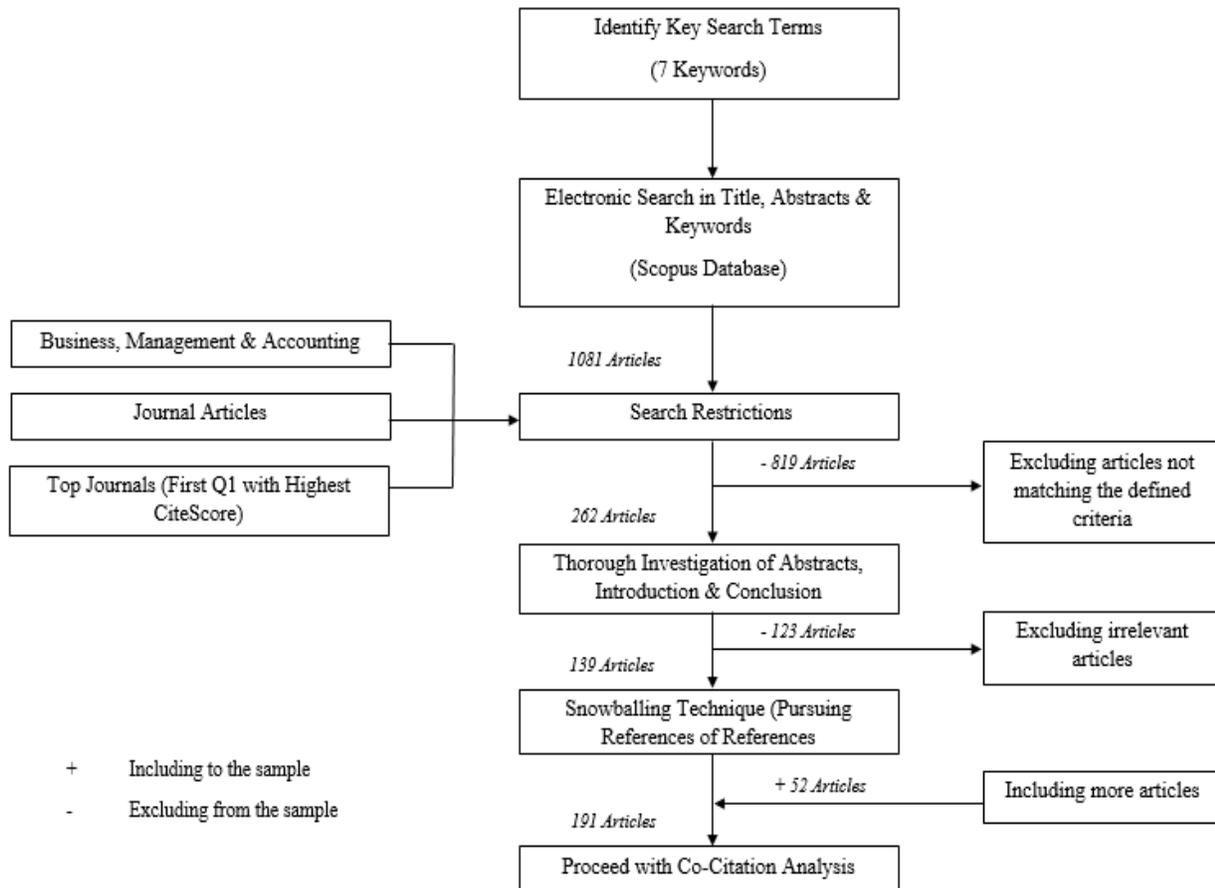


Figure 1- Flow Diagram of Sampling Procedure for the SLR

### 3.2 Retrieval of Co-Citation Matrix

In order to provide a co-citation matrix based on 191 identified source documents or cited articles (Hua & Yang, 2011; Nerur et al., 2008; Ramos-Rodriguez & Ruiz-Navarro, 2004), we retrieved a total of 1985 citing documents which cite those cited ones. We followed the same search restrictions meaning that only the same journals, identified previously, were targeted. Each cited document was paired with every other cited one to count the frequency in which those two articles (citing and cited article) are referenced together. However, we considered our matrix with the minimum citation threshold of 3. This number was chosen to see whether two documents together were fairly cited or not. Therefore, only documents cited jointly three times or more were presented, otherwise they were excluded from the analysis. As such, out of 191 identified articles, 93 qualified articles remained (Table 1). Then, we formed a  $93 \times 93$  square co-citation matrix whose main diagonal was filled out by missing values or zeros. The co-citation matrix was then converted into Pearson's co-relation matrix for the following statistical analyses.

Table 1- Set of Source Documents

<b>ID</b>	<b>Author (Year)</b>	<b>ID</b>	<b>Author (Year)</b>	<b>ID</b>	<b>Author (Year)</b>
A1	Mac Duffie (1997)	A36	Alexiev et al. (2010)	A71	Thomas (1984)
A2	Lyles (1981)	A37	Miller (2008)	A72	Walker Ii & Cox Iii (2006)
A3	Garvin (1993)	A38	Heavey et al., (2009)	A73	Volkema (1986)
A4	Büyükdangaci (2003)	A39	Chen & Lee (2003)	A74	Turner & Makhija (2012)
A5	Baer et al. (2013)	A40	Cray et al. (1988)	A75	Levinthal (2011)
A6	Schwenk (1995)	A41	Abdulrahman et al. (2015)	A76	Ackoff (1981)
A7	Lyles (1987)	A42	Grundy & Wensley (1999)	A77	Powell (1995)
A8	Easton & Rosenzweig (2012)	A43	Schmidt et al. (2001)	A78	Hitt & Tyler (1991)
A9	Hodgkinson et al. (1999)	A44	Dooley et al. (2000)	A79	Macher (2006)
A10	Papadakis et al. (1998)	A45	Rindova (1999)	A80	Elbanna (2012)
A11	Eisenhardt & Zbaracki (1992)	A46	Tuggle & Gerwin (1980)	A81	Jemison (1981)
A12	Elbanna & Child (2007a)	A47	Subramoniam et al. (2010)	A82	Armstrong (1982)
A13	Elbanna & Child (2007b)	A48	Mueller et al. (2007)	A83	Elenkov (1997)
A14	Nutt (1998)	A49	Judge & Miller (1991)	A84	Olson et al. (2007)
A15	Kukalis (1991)	A50	Bohn (2000)	A85	Langley (1990)
A16	Dutton et al. (1983)	A51	Repenning & Sterman (2002)	A86	Miller (1997)
A17	Dooley & Fryxell (1999)	A52	Tucker et al. (2002)	A87	Tsang (2004)
A18	Dean & Sharfman (1996)	A53	Tucker & Edmondson (2003)	A88	Werder (1999)
A19	Amason (1996)	A54	Staats et al., (2011)	A89	Iaquinto et al. (1997)
A20	Clark & Maggitti (2012)	A55	Volkema (1983)	A90	Martinsons et al. (1999)
A21	Preston et al. (2008)	A56	Volkema & Gorman (1998)	A91	Schwenk (1988)
A22	Ashmos & McDaniel (1996)	A57	Nickerson & Zenger (2004)	A92	Subramoniam et al. (2009)
A23	Lucy et al. (2005)	A58	Schroeder et al. (2008)	A93	Papke-Shields & Malhotra (2001)
A24	Hough & White (2003)	A59	De Mast (2011)		
A25	Ashmos, et al. (1998)	A60	Choo (2014)		
A26	Zehir & Özsahin (2008)	A61	Helfat & Peteraf (2015)		
A27	Sharfman & Dean (1997)	A62	Gray (2001)		
A28	McKenzie et al. (2009)	A63	Das & Teng (1999)		
A29	Wolfe & Jackson (1987)	A64	Sage (1981)		
A30	Baum & Wally (2003)	A65	Nutt (1984)		
A31	Miller et al. (1998)	A66	Beer et al. (1990)		
A32	Keats (1991)	A67	Priem et al. (1995)		
A33	Fahey (1981)	A68	De Mast & Lokkerbol (2012)		
A34	Wright & Goodwin (2002)	A69	Ho & Sculli (1997)		
A35	Nutt (1998)	A70	Spear (2004)		

Table 2 summarizes the main information regarding the journals considered for the co-citation matrix in our review. Journals with less than three articles to study are classified in “Othres”. Examples are “Production and Operations Management”, “California Business Review”, and “Academy of Management Journal”.

Table 2, Selected Articles Details

<b>No.</b>	<b>Journal</b>	<b>Count of Article</b>	<b>%</b>
1	Strategic Management Journal	28	30.10
2	Journal of Management Studies	11	11.82
3	Journal of Management	6	6.45
4	Organization Science	8	8.60
5	Journal of Operations Management	4	4.30
6	OMEGA	3	3.22
7	Harvard Business Review (HBR)	4	4.3
8	Management Science	4	4.3
9	Decision Support System	3	3.22
10	International Journal of Production Economics	3	3.22
11	Management Decision	3	3.22
12	Administrative Science Quarterly	3	3.22
13	Journal of Cleaner Production	3	3.22
14	Decision Science	3	3.22
15	Others	7	7.52

### **3.3 Results of Co-Citation Analysis**

#### **3.3.1 Factor Analysis**

Factor analysis (FA) is used, with Varimax rotation, to extract the key conceptual themes in the studied literature (Hua & Yang, 2011). FA generates various factors based on the loading values of each cited article for the produced factors. These loading values reveal how relevant one article is for the factor, and subsequently how different articles could be grouped together (Hua & Yang, 2011; Nerur et al., 2008). However, articles could contribute differently to the factors. The higher loading value, the more contribution of the document on that particular factor. Given the highest loading value (Table 3), we group all the cited articles into three main clusters: (C<sub>1</sub>) problem formulation, (C<sub>2</sub>) general definitions and APS characteristics, and (C<sub>3</sub>) strategic decision making.

Table 3- Results of Factor Analysis

Factor 1		Factor 2		Factor 3	
Problem Formulation	Loading Value	Genral Definition & APS Characteristics	Loading Value	Strategic Decision Making	Loading Value
A 1	0.868	A 2	0.869	A 6	0.816
A 3	0.736	A 4	0.724	A 9	0.703
A 5	0.871	A 7	0.910	A 10	0.823
A 8	0.821	A 15	0.544	A11	0.571
A 50	0.635	A 16	0.853	A 12	0.834
A 52	0.844	A 29	0.855	A 13	0.834
A 53	0.817	A 32	0.741	A 14	0.804
A 54	0.863	A 33	0.922	A 17	0.756
A 57	0.488	A 40	0.673	A 18	0.744
A 58	0.681	A 46	0.931	A 19	0.759
A 59	0.452	A 55	0.902	A 20	0.787
A 60	0.869	A 64	0.621	A 24	0.809
A 61	0.568	A 65	0.599	A 27	0.834
A 68	0.668	A 71	0.967	A 30	0.775
A 69	0.452	A 73	0.968	A 37	0.825
A 70	0.787	A 77	0.869	A 42	0.721
A 74	0.661	A 82	0.645	A 49	0.747
A 75	0.650	A 86	0.686	A 56	0.844
A 78	0.724	-	-	A 67	0.754
A 80	0.652	-	-	A 79	0.805

- Note1: Total Variance Explained: 70.5 % with eigenvalue greater than 1

- Note 2: 20 articles out 28 in factor 1, and 20 ones out of 47 in factor 3, with highest absolute loading values for each generated factor, are reported.

Papers in C<sub>1</sub> address a disciplined approach for a permanent problem resolution with an emphasis on problem analysis. However, a set of organizational factors are prescribed to facilitate this behavior mode. For example, Mac Duffie, (1997) conduct a study on three automotive assembly plants and list three complex operational problems (i.e. water leaks, paint defects, and electrical defects). He emphasizes problem analysis for process improvement and examines the organizational influences for root-cause removal. Similarly, Tucker et al. (2002) conduct a study on problem-solving behavior of nurses in the context of hospitals where root-cause removal is highlighted as a key to put fundamental solutions in place and prevent the problem re-occurrence. However, to engage the front-line employees for root-cause investigation, the study suggests a bundle of organizational, social, and cognitive factors to ensure the success of APS adoption.

Most of papers positioned in C<sub>2</sub> adopt a macro perspective with a clear definition for APS and its structure. The focus is to present a framework with the main processes to follow in the face of dealing with unstructured and complex problems. The framework proposed includes a course of actions that begins with the identification of the problem, goes through the problem analysis and ends with the discovery of the most applicable solution (e.g. Nutt 1984; Dutton et al., 1983; Lyles, 1981; Fahey, 1981).

C<sub>3</sub> presents the papers to investigate a rational-comprehensive behavior while making strategic decisions. In this cluster, strategic decision-making is described as a managerial process, at strategic level of the organization, where formal planning along with organization-specific characteristics seem substantial for the long-term decision success. Studying the papers in C<sub>3</sub> reveals that, an adequate attention to environmental elements also matters for the successful APS adoption. As an example, Baum and Wally (2003) investigate the mediating effect of the speed in strategic problem solving (what they call strategic decision making) on the relationship between environmental factors (i.e. dynamism and munificence) and organization structure (i.e. power decentralization and formalization of routines) with firm performance.

### **3.3.2 Cluster Analysis & Multidimensional Scaling**

Multi-dimensional scaling (MDS) and cluster analysis (CA) are performed in order to corroborate the results obtained from FA (Tarantini et al., 2017). MDS, as a data reduction technique, arranges cited articles in a two-dimensional space based on the correlation between articles. The map provided (Figure 2) is the result of grouping articles based on similarities (Nerur et al., 2008). The stress value (0.19, lower than 0.2 as an acceptable value) demonstrates an acceptable fit for our data (Hua & Yang, 2011; Nerur et al., 2008). Like FA, MDS illustrates three clusters in a two-dimensional space. The horizontal axis represents the nature of the challenge,

whether it is a problem or decision. From left to right along the x-axis, the nature switches from the problem to the decision. In other words, the left-hand side of the map contains the articles that offer APS to deal with the complex problems either at operational or managerial level of the organization, while articles on the right-hand side encourage this behavior mode just for strategic decisions. The vertical axis serves the articles according to the level of analysis. As we go further from below to above the y-axis, the attention moves from a broad-big picture view- (i.e. Macro) to a more focused (i.e. Micro) level of analysis. Researches that adopt a micro level of analysis discuss different factors influential on APS and establish the elements necessary to gain the most of this behavior mode. However, articles with a macro perspective address APS as one possible way to formulate the problems (and not the only one) and discuss mainly the structure and the main activities (i.e. problem definition, problem analysis, and solution design) to follow for the APS adoption.

Based on hierarchical CA, all the documents were analyzed into a Dendrogram using a complete link where the distances between clusters equal the distance between those two articles (one in each cluster) that are farthest away from each other. The results of CA are in line with MDS and FA to identify three clusters for APS in the management literature.

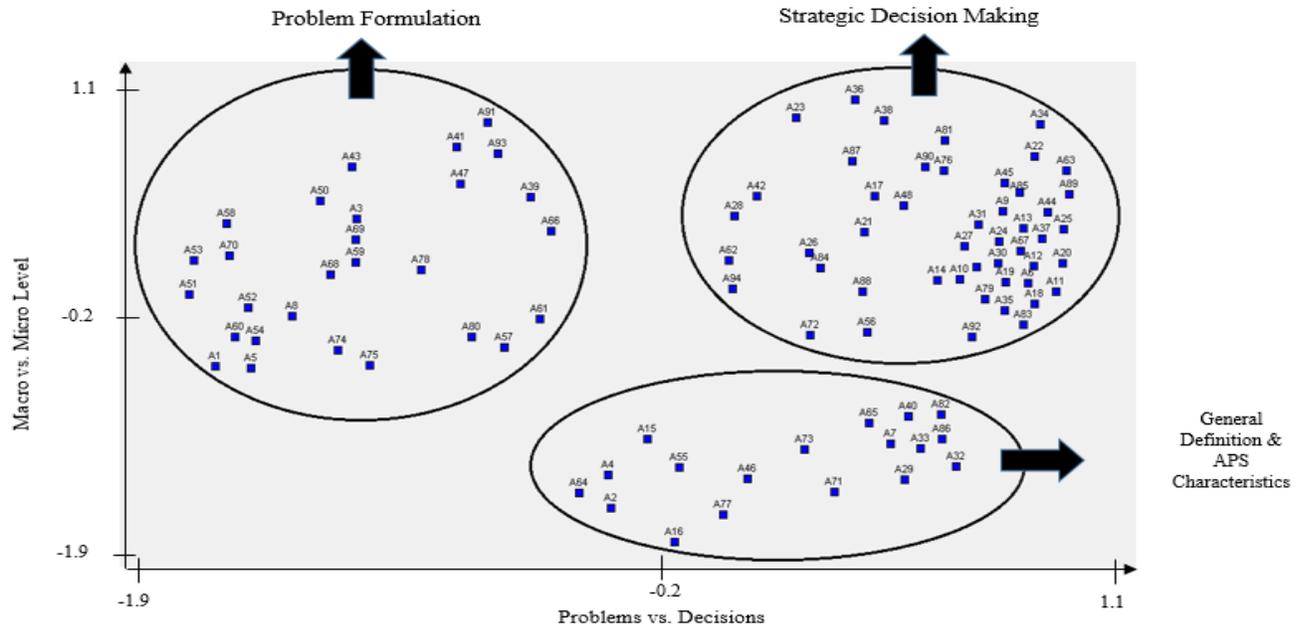


Figure 2- Results of Multidimensional Scaling (MDS) and Cluster Analysis (CA)<sup>3</sup>

#### 4. Cross-Cluster Analysis

We consider the identified clusters, concluded from FA, MDS, and CA, as a platform to discuss and compare APS supporting factors and enabling conditions of this behavior mode. However, C<sub>1</sub> and C<sub>3</sub> appear to be more relevant to our purpose than papers in C<sub>2</sub> since they adopt a micro perspective and provide the detailed and fundamental level of analysis. Moreover, C<sub>1</sub> and C<sub>3</sub> analyze APS adoption and highlight various factors and conditions through which an analytical approach to problem solving can yield an enhanced performance. Papers positioned, in C<sub>2</sub>, although helpful to clearly define APS and discuss its structure, are deemed to be inadequate in explaining the supporting factors of APS. Indeed, these papers do not provide any indications about the organizational antecedents for, and the contingencies of, a successful adoption of SPS due to the macro perspective adopted. Moreover, most of the papers in C<sub>2</sub> seem to contribute less

<sup>3</sup> Document co-citation analysis is done by UCINET software. Borgatti, S.P., Everett, M.G. and Freeman, L.C. 2002. Ucinet 6 for Windows: Software for Social Network Analysis. Harvard, MA: Analytic Technologies.

to the recent literature as they mostly discuss what the APS is and what processes should be followed for this mode. Therefore, we exclude C<sub>2</sub> and thoroughly investigate C<sub>1</sub> and C<sub>3</sub> using a social network analysis (SNA). In fact, the SNA is employed mainly for two reasons. First, to visualize the results and demonstrate how different APS supporting factors are commonly addressed by C<sub>1</sub> and C<sub>3</sub>. Second, to investigate the importance of each factor. We define the importance of each factor as the total number of times in which that particular factor is referred to by the cited documents. The network is sorted based upon in-degree as the number of arrows enters into a node. So, the more one factor is cited, the higher in-degree value, and the bigger size in the provided network. Figure 3 shows the cross-cluster analysis using a SNA.

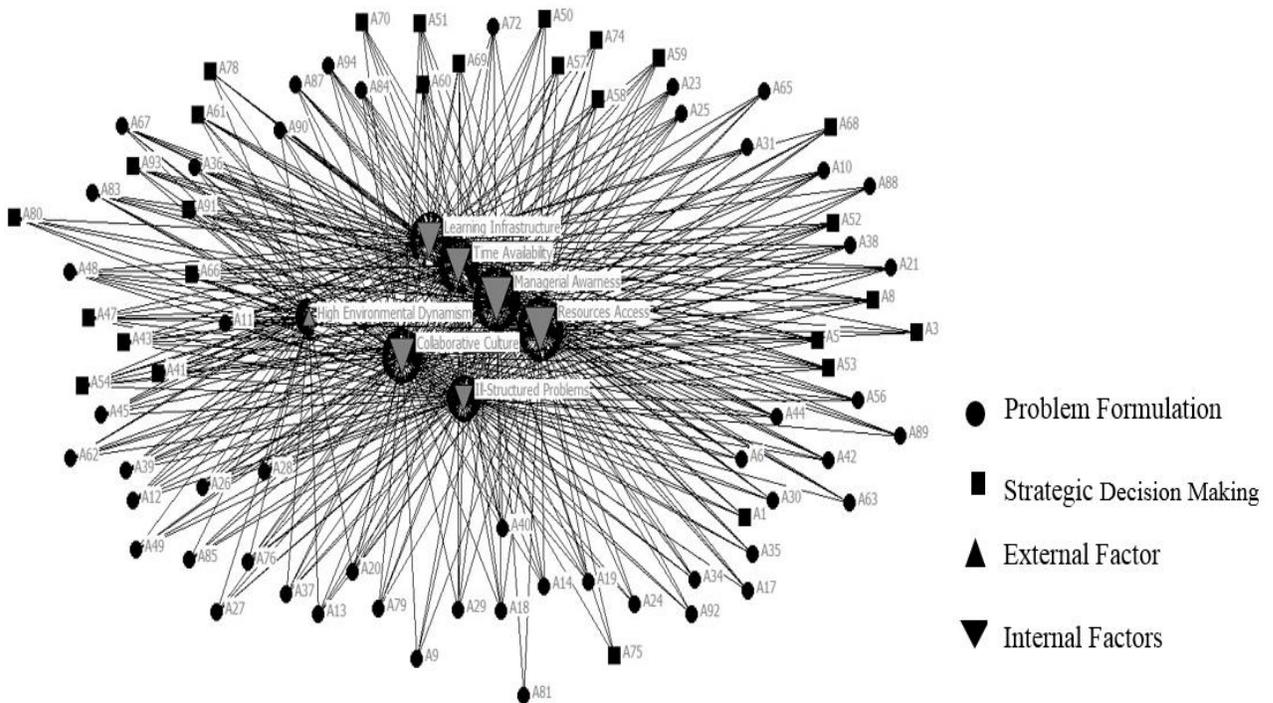


Figure 3- Cross-Cluster Analysis Using the SNA

Cross-cluster analysis reveals that regardless of the nature of the challenge, if this is a problem (C<sub>1</sub>) or a decision (C<sub>3</sub>), a set of common factors could increase the likelihood of the successful

APS. In both clusters, APS is recommended as a way to improve the firm-level performance but such a relationship is *contingent* at the presence of some factors. In other words, a *contingent* rather than a deterministic relationship might provide a more accurate explanation of the APS adoption. So, we determine internal and external contingency factors, present in both clusters, through which APS is most likely to succeed.

On the one hand, internal contingency factors (internal factors hereafter), mostly related to the business decisions, refer to (a) the nature of the problem, in particular the level of complexity, ambiguity, and novelty, and (b) a set of institutional factors for the successful APS adoption. Time availability, organizational resources access, collaborative culture, managerial awareness, and learning infrastructures are discovered according to the cross-cluster analysis and considered as the APS organizational antecedents. On the other hand, we also emphasize one external contingency factor (external factor hereafter), imposed by the external environment and thus mostly beyond the control of the organization. Arguably, high environmental dynamism affects the course of actions for comprehensive problem formulation. In the next section, we thoroughly describe each and explain how they contribute to the successful implementation of APS.

#### **4.1 Internal Factors**

As noted earlier, identified internal factors are divided into two groups of (a) related to the nature of the problem and (b) the institutional factors, introduced as the APS organizational antecedents.

(a) Ill-Structured Problems- The nature of the problem or the decision affects the way problem-solvers approach the challenges (Macher, 2006; Papadakis et al., 1998). However, not every problem manifests itself in a well-structured and well-formulated fashion (Astor et al., 2016; Walker & Cox, 2006; Thomas, 1984). Armstrong (1982) demonstrate that formal planning while

making strategic decisions (i.e. APS) tends to be effective where large changes are required or when a problem is engaged with high complexity and uncertainty. In nature, problems vary along a continuum from ill-structured to well-structured problems. Well-structured problems are those with a clear explanation for their occurrence and complete information usually with known and certain relationships between problem variables, whereas ill-structured or unstructured problems are characterized by uncertainty, complex interconnectedness and causal ambiguity (Laureiro-Martinez & Brusoni, 2018; Ellspermann et al., 2006; Büyükdamgaci, 2003; Smith, 1988). Examples for well-structured problems are routine problems with a clear gap to bridge. However, strategic decisions (e.g. new product development and merger decisions, to name a few) mostly are known as ill-structured problems (Mitchell et al., 2011; Mintzberg et al., 1976).

The synthesis of the literature shows that, APS is normally recommended when few information is available regarding the problem structure such as the key problem, its drivers, and the best solution to take (Baer et al., 2013; Werder, 1999). Otherwise, when a problem is known or at least the problem-solver knows how to approach it, APS becomes unnecessary or insufficient. The reason is that APS is costly (e.g. Repenning & Sterman, 2002; Mac Duffie, 1997; Smith, 1988) and problem-solvers are not required to invest on organizational resources for a problem with an already-known-solution. Hence, dealing with well-structured problems creates more incentives for IPS adoption because information on the problem is available and solution strategies are clear (Macher, 2006). On the contrary, coping with ill-structured problems raises the necessity of APS since for this type of problems, unlike well-structured ones, there is no complete and already-known-solution. In other words, ill-structured problems are engaged with a high level of uncertainty and accordingly attempts should be made to structure the problem through gathering the relevant and valid information (Baer et al., 2013; Werder, 1999). Rich information regarding

the problem and its drivers leads to discover the fundamental solution to respond properly to the observed challenge. All in all, we claim that ill-structured problems are subject to internal uncertainty and APS is strongly recommended to mitigate this uncertainty through valid information collection. This includes effective search strategies to discover the major problem, highlight the key root-causes, and implement the best solution.

In addition to the nature of the problem, we define a set of organizational antecedents, common in both problem formulation cluster and strategic decision-making cluster, for the successful APS adoption. We argue that, solving a problem fundamentally (for C<sub>1</sub>) and making a strategic decision properly (for C<sub>3</sub>), different in nature though, require a bundle of organizational antecedents for the APS. These factors are thoroughly discussed as follows.

(b.1) Time Availability- Problem-solvers and decision-makers are required to spend a lengthy time in order to comprehensively formulate a problem (Morrison, 2015; Choo, 2014; Tucker & Edmondson, 2003; Tucker et al., 2002; Bohn, 2000; Werder, 1999; Mac Duffie, 1997; Mintzberg et al., 1976). Moreover, literature asserts the idea that APS should not be rushed (Marksberry et al., 2010; Grundy & Wensley, 1999). In a similar vein, Repenning and Sterman (2002) characterize APS as a process-improvement behavior whose output is paid off in the long-term. Therefore, problem-solvers should have a sufficient amount of time to gain the most out of this behavior mode, with a substantial delay. Otherwise, if they are under time pressure to react immediately, they simply jump to the solution and adopt IPS (Helfat & Peteraf, 2015; Lyles, 1981). Based on a study conducted by Tucker et al. (2002) lack of slack time to spend for APS is one of the major reasons that drives front-line employees toward taking prompt cares. Applying these insights from the body of the literature, we claim that time availability emerges as a critical factor for problem-solvers to fully engage in comprehensive problem formulation activities.

(b.2) Organizational Resource Access- Easy access to organizational resources seems necessary for both problem formulation and decision-making (Büyükdamgaci, 2003; Lyles, 1981; Nickerson & Zenger, 2004; Schroeder et al., 2008). This claim is reinforced by Smith (1988, p. 1489): “It pays to think before you act” where the thinking refers to APS. Knowledge-based theory (KBT) of the firm also indicates the importance of information access to create valuable knowledge, which is eventually necessary for decision success (Macher, 2006; Nickerson & Zenger, 2004; Gray, 2001). Moreover, relying on a set of personal assumptions to overcome complex problems with uncertainty and lack of clear evidence for their occurrence (i.e. ill-structured problems) seems ineffective. This holds true for strategic decisions as well where the best option to take is not available yet. Information, as the most considerable strategic resources and the main dimension of rationality, is foundational for uncertainty reduction in APS (Baer et al., 2013; Mueller et al., 2007; Argyris, 1976; Duncan, 1972). Without relevant and valid information it is nearly impossible to develop a set of alternative actions and subsequently select the most appropriate solution (Tucker et al., 2002; Nutt, 1998; Eisenhardt & Zbaracki, 1992). As a matter of fact, when problem-solvers fail to obtain the relevant information, they just rely on their prior knowledge. This increases the likelihood of IPS by devising already-made-solutions according to their personal hypotheses (Astor et al., 2016; Das & Teng, 1999).

However, information gathering is costly and hence a considerable investment on other resources such as money, and manpower is required (Baer et al., 2013; Iaquinto & Fredrickson 1997; Rodriguez & Hickson, 1995; Mintzberg et al., 1976; Dutton et al., 1983). For instance, Mac Duffie (1997) addresses APS as a costly behavior mode and considers cost concern as a barrier that often precludes APS. Therefore, having access to organizational resources, not only strategic

ones in particular relevant information but also sufficient quantity of other resources to obtain valid information, seems essential for the comprehensive problem formulation.

(b.3) Collaborative Culture- A considerable number of articles point that group problem-solving is likely to facilitate APS (Morrison, 2015; Choo, 2014; Staats et al., 2011; Reppenning & Sterman, 2002; Bohn, 2000; Grundy & Wensley, 1999; Ashmos et al., 1998; Longenecker et al., 1994). Morrison (2015) prescribes working collaboratively with the higher employee participation to respond properly to the resource shortage problem and enhance the productivity accordingly. Schmidt et al. (2001) empirically show that face-to-face team-work outperforms individually working for strategic decisions (i.e. new product development). The reason is that working in a team generates more ideas regarding how to structure a problem and what to do in order to discover the best alternative solution to take. This occurs when a problem is viewed through multiple perspectives of team members as Baer et al. (2013) conclude that heterogeneous information sets, provided by different team members with different cognitive structure, lead to the problem formulation comprehensiveness. When a synthesis of different viewpoints to the same problem is developed and consensus among group members is reached, problem-solvers achieve more solution with the higher quality (Baer et al., 2013; Dooley et al., 2000; Amason, 1996). Brainstorming (Staats et al., 2011; De Mast, 2011; Miller, 2008), open internal communication (Dooley & Fryxell, 1999; Powell, 1995), increased employee involvement (Marksberry et al., 2010, 2011), and productive debriefing sessions (Keats, 1991) are some examples reinforcing the importance of this factor.

(b.4) Managerial Awareness- Managerial awareness plays the most critical role for problem-solving as almost all the reviewed articles, in both C<sub>1</sub> and C<sub>3</sub>, highlight it. The importance of this

factor is asserted according to the SNA performed for the cross-cluster analysis (previously shown in Figure 3).

Literature on problem-solving and decision making promotes senior executives' attention not only for their decisions at strategic level (Mueller et al., 2007; Bourgeois & Eisenhardt, 1988), but also for an effective operational problem-solving due to their leadership behavior and management style (Morrison, 2015; Repenning & Sterman, 2002). Isenberg (1986) describes a manager's job to plan and implement the actions for the problem formulation comprehensiveness.

In order to successfully do their job, managers need to perform and coordinate a complex set of different tasks. Indeed, a proper leadership is needed to successfully carry out all these different tasks such as allocate resources to problem solving activities (Morrison, 2015), provide necessary training (Marksberry et al., 2010; Repenning & Sterman, 2002; Gray, 2001; Garvin, 1993), encourage front-line employees to participate in APS by developing the right incentives system (Baer et al., 2013; Garvin, 1993), create commitment (Dooley et al., 2000; Amason, 1996; Powell, 1995; Keats, 1991), and trigger continuous improvement, change and learning (Bohn, 2000; Longenecker et al., 1994; Beer et al., 1990).

Besides the aforementioned tasks, executives are required to create and nurture an overarching supportive culture for APS. Managers with short-term horizon are more likely to prefer an approach to problem solving that yields immediate and tangible results (Repenning & Sterman, 2002). The "Don't bring me problems, bring me solutions" type of culture (Frei, 2007, p. 3) creates pressures to front-line employees to solve the problems quickly and adopt solutions that are just temporary fixes to problems that will soon reoccur.

Moreover, the tendency of managers to blame employees for their mistakes creates a context where employees, instead of exposing their problems, find immediate solutions or experience quick workarounds that mask the underlying system weaknesses (Lyles, 2014; Ho & Sculli, 1997; Mac Duffie, 1997; Volkema, 1986).

To conclude, managerial awareness in the shape of an appropriate leadership is essential, not only to accomplish vital tasks necessary for the successful implementation of APS, but also to create a supportive context where the right behaviors can flourish.

(b.5) Learning Infrastructures– APS is more likely to be successful when learning infrastructures are established and maintained in the organization. Learning infrastructures includes two components.

One is represented by the presence in the organization of codified organizational routines for structured problem solving. These routines are intended to guide systematic behaviors aimed at defining the problem, analyzing the root cause, devising alternative countermeasures, checking the results of the implementation and, finally, standardizing the successful solution. Different examples of these routines are A3 (Astor et al., 2016; Marksberry et al., 2011), Six Sigma DMAIC (De Mast & Lokkerbol, 2012; Easton & Rosenzweig, 2012), 5-whys analysis (Myszewski, 2013). Besides providing a guide for systematic problem solving, the enactment of these routines develops over time common communication codes that help to share information (Mac Duffie, 1997) and nurture a collaborative culture within the organization.

The second component of learning infrastructures refers to artifacts and immaterial assets that support SPS. The most common examples of artifacts are standard operating procedures or SOPs (Baum & Wally, 2003; Lyles & Thomas, 1988). SOPs allow operators to follow a standard

sequence of tasks thus facilitating the identification of anomalies (and problems) when something is out of standard. Management support systems such as quality management system (Marksberry et al., 2010; Powell, 1995) and decision support system (Martinsons et al., 1999) are also included in this factor. These assets (that are part of the broad category of information system) provide information to managers and operators to conduct analysis of problems and identify the best alternative solutions. Finally, we consider efficient and formal communication channels (Clark & Maggitti, 2012; Baum & Wally, 2003; Martinsons et al., 1999) and, more broadly, an organization structure that allows decentralized decision making and gives autonomy for intervention to lower-level members (Zehir & Özsahin, 2008; Papadakis et al., 1998; Powell, 1995). We call this factor as learning infrastructures as they are extremely useful to obtain rich information regarding the problem structure and eventually facilitate the knowledge articulation and codification.

#### **4.2 An External Factor: Environmental Dynamism**

An external factor, mostly beyond the control of the organization and thus difficult to manage, is an environmental dynamism. The environment dynamism is characterized by competition, technological developments, and the changes in customers' requirements (Duncan, 1972). There is a huge body of literature that provides a convergent support for the importance of external environment while making decisions (Miller, 2008; Mueller et al., 2007; Elbanna & Child, 2007b; Iaquinto & Fredrickson, 1997; Dean & Sharfman, 1996; Elenkov, 1997; Eisenhardt & Bourgeois, 1988; Jemison, 1981). However, despite a considerable agreement on the effects of external environment on decision-making, no consensus is found in the literature regarding how it affects the APS adoption and firm-level performance consequently. Reviewing the literature indicates that, there are seemingly two contradictory viewpoints regarding the use of APS in turbulent environments. One group of studies maintains that APS should be adopted in high-velocity

environments. Based on this viewpoint, turbulent environments with continual changes in customers' requirements, high technological development, and intense competition are considered as one substantial contributor of the uncertainty. They argue that attempts should be made to gather valid and necessary information and mitigate the external uncertainty. However, one way to obtain rich information and reduce the imposed uncertainty is to adopt APS (e.g. Child & Rodrigues, 2011; Mueller et al., 2007). For example, Bourgeois and Eisenhardt (1988, p. 827), conclude that, "high velocity environments force executives to go through a rational process of identifying goals, setting priorities, collecting information and generating alternatives to gain a sense of control". On the contrary, the second group of studies support APS adoption in stable environments (Fredrickson, 1984; Fredrickson & Mitchell, 1984). This group discusses that, in a less turbulent environment, there is no pressure from external actors (e.g. customers, and competitors) and as a consequence, problem-solvers can take their time, comprehensively formulating the faced problem and implement the most appropriate solutions (Kukalis, 1991). For instance, Eisenhardt (1999, p. 66) state: "in high-velocity markets, there is no time for formal meeting and no place for careful consideration of extensive information". Put it differently, in high-velocity environments, APS is less applicable because information is rather difficult to gather due to unpredictable, unstable and complex environmental changes (Hough & White, 2003; Fredrickson & Iaquinto, 1989; Fredrickson & Mitchell, 1984; Dutton et al., 1983). Although the studies seem to conclude contradictorily, we rest on the first viewpoint claiming that high-velocity environments raise the necessity of APS adoption. In line with our theoretical development as well as the focus of the study to seek the conditions through which APS is more likely to succeed, we claim that high-velocity environments are subject to the uncertainty. We label this type of uncertainty as the external or environmental uncertainty because it is related to the business external environment.

In this regard, APS adoption is recommended to mitigate the perceived uncertainty concerned with unpredictable changes in customer requirement, competitors' strategies, and technological development. In fact, even in this environmental setting that usually quick reactions are required, APS should be encouraged but only if a set of institutional factors (i.e. previously identified as APS organizational antecedents) are established in the organization (e.g. Child & Rodrigues, 2011; Mueller et al., 2007; Bourgeois & Eisenhardt, 1988).

## **5. Discussion**

The results of this study reveal that APS is not only suggested for the comprehensive problem formulation but also emphasized for the strategic decision making. Indeed, APS as a superior mode compared to IPS is stressed for both operational problems and managerial decisions. However, in order to fully reap the benefits of this superior behavior mode, this study discovers the APS supporting factors or enabling conditions through which APS is more likely to succeed.

Problem-solving research devotes attention on APS adoption to gather valid and reliable information to mitigate the uncertainty (Miller, 2008; Hodgkinson et al., 1999; Bourgeois & Eisenhardt, 1988). However, based on the synthesis of the literature, we identify two major contributors to the perceived uncertainty.

The first one, called internal uncertainty, is related to the nature of the problem. Well-structured problems have low internal uncertainty since the current and end states are clearly identified and the options and methods to select the best solution are known (through experience) or knowable (through computation) (Laureiro-Martinez & Brusoni, 2018). Ill-structured problems, conversely, are those where there is great uncertainty since both current and end states are not clearly identified and there is not a repertoire of solutions available (Laureiro-Martinez & Brusoni, 2018). Problems

that are ill-structured problems are difficult to cope with due to the lack of complete information regarding the problem structure (Ellspermann et al., 2006; Büyükdamgaci, 2003; Smith, 1988). Moreover, in ill-structured problems there exist many possible cause-and-effect relationships inherent and the problem solver must “must generate and evaluate alternative states of the problem, their outcomes, and their impacts—on the individual themselves” (Laureiro-Maritnez and Brusoni, 2018). For these type of problems, individuals should adopt an analytical approach to formulate the problem comprehensively, try to articulate its structure, devise the possible alternatives and scenarios, and evaluate the adequate courses of actions.

The second type of uncertainty, known as external or environmental uncertainty, is related to environmental dynamism as measured by intense competition, high technological development, and frequent changes in customers’ requirements (Elbanna, 2012; Elbanna & Child, 2007; Hough & White, 2003; Lyles, 1981; Duncan, 1972). When confronted with a dynamic environment, problem solvers are required to employ an analytical reasoning to problem solving focusing on gathering valid information to curb environmental uncertainty. Information gathering should pertain both environmental scanning (e.g. monitoring customers and competitors) and formal planning in the presence of different possible scenarios (Helfat & Peteraf, 2015; Lucy et al., 2005; Rindova, 1999; Elenkov, 1997) for the aim of external uncertainty mitigation.

Therefore, it is the presence of high uncertainty (generated by either the nature of the problem or the environmental dynamism) that makes the adoption of APS necessary to formulate the problem comprehensively, explicate its structure and accordingly minimize both internal and external uncertainties.

Uncertainty reduction seems essential for the way problem-solvers approach and respond to the problems, from a cognitive perspective (Astor et al., 2016; Das & Teng, 1999; Hodgkinson et al.,

1999). Based on human cognition, individuals mostly respond to any stimuli unconsciously relying on the sensory processing. This is called “automatic information procession” (Astor et al., 2016) or “type 1 processing” (Evans & Stanovich, 2013) interpreted as a natural tendency to jump to a solution by pursuing a feeling-based information processing (i.e. IPS). We argue that, the cognitive structure of problem-solvers could be reinforced or constrained by the level of complexity and perceived uncertainty. Evans and Stanovich (2013) demonstrate that the instinctive reaction of individuals, as the results of “type 1 processing”, is assumed to be constrained by a higher-order reasoning, i.e. APS. In other words, to intervene information processing of individuals and activate their analytical mode, uncertainty should be minimized through collecting valid and necessary information. Otherwise, problem-solvers are more likely to solely rely on judgmental rules to simplify the problems (McKenzie et al., 2009; Das & Teng, 1999; Schwenk, 1988; Ashmos et al., 1998) and eventually devise a shortcut based on their past experience to react, i.e. IPS adoption (McKenzie et al., 2009; Das & Teng, 1999; Lyles & Thomas, 1988; Nutt, 1984).

However, to reduce the level of uncertainty and subsequently activate the individual’s analytical reasoning, a set of institutional factors (i.e. APS organizational antecedents) is required. APS organizational antecedents influence the individual’s cognitive structure for the way they approach the problems. We highlight time availability, organizational resources access, collaborative culture, managerial awareness, and learning infrastructure and claim that these factors most likely narrow the cognitive limitation of problem-solvers, minimize their natural tendency for IPS adoption, and in turn reinforce the likelihood of the successful APS adoption. As an example, Baer et al., 2013 address managerial attention to promote team-work with heterogeneous information sets and different cognitive structure of team members to minimize the potential of pursuing the self-interest behavior (i.e. IPS). Similarly, Reppenning and Serman (2002) claim that top

management failure to provide necessary training and allocate resources effectively is recognized as a major incentive to adopt IPS. They argue that, based on the cognitive structure of the individuals, IPS takes precedence over APS due to its more certain outcomes with less delay and cost.

The claim that APS organizational antecedents are extremely helpful in highly-turbulent environments is also investigated in the literature. Bourgeois and Eisenhardt (1988), first, illustrate that the cognitive limitation of decision-makers curbs rational-comprehensive analysis due to incomplete information. Then, they conclude about the substantial role played by top managers for resource allocation, and collaborative culture for the successful APS in high-velocity environments. Many studies in this regard show that, when there is a higher pressure from the external environment, there is a higher need for information gathering. One way to obtain necessary information and also reduce the imposed uncertainty is to adopt APS (e.g. Child & Rodrigues, 2011; Mueller et al., 2007).

Figure 4 synthesizes the overall model that has emerged from our review whose primary focus is to demonstrate how to adopt APS for problem resolution.

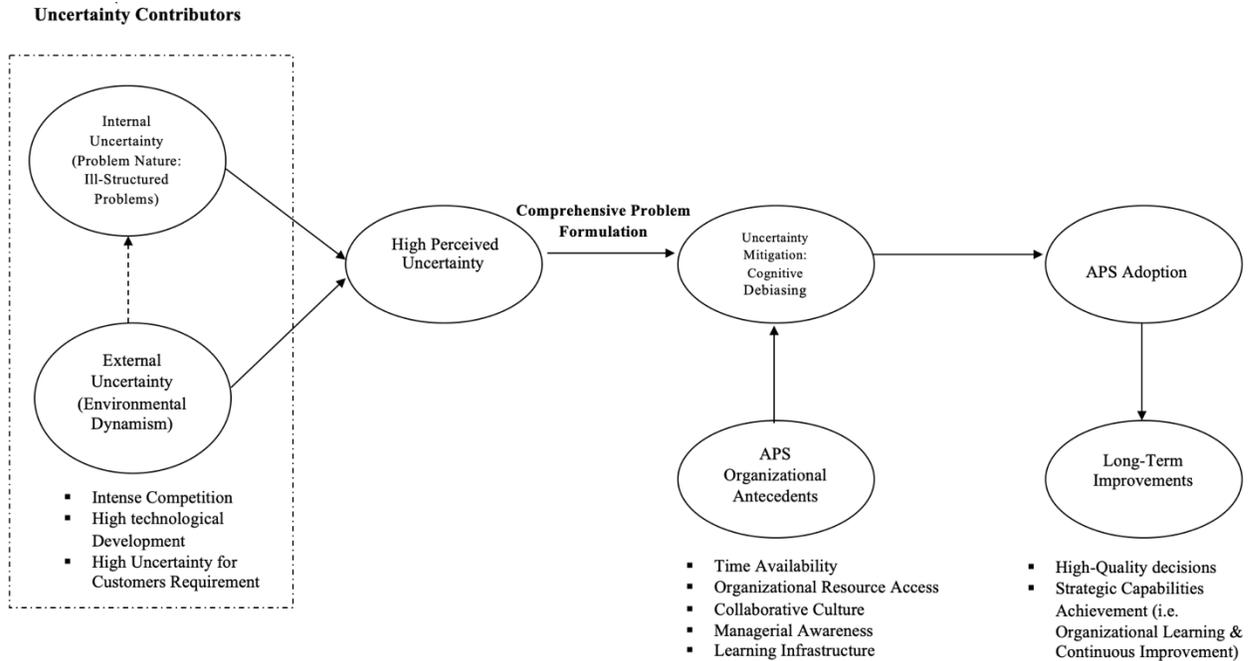


Figure 4, A Proposed Model for APS adoption

As described earlier, in order to comprehensively formulate a problem, both internal uncertainty (related to the nature of the problem) and external uncertainty (associated with high environmental dynamism) should be minimized. Indeed, when the level of perceived uncertainty is low, problem-solvers rely on the valid and rich information rather than their pre-existing hypothesis and previous experiences. This is called cognitive debiasing, i.e. to overcome the instinctive reaction of individual's information processing. However, we address a set of institutional factors, introduced as APS organizational antecedents (i.e. time availability, organizational resources access, collaborative culture, managerial awareness, and learning infrastructure), necessary to reduce the perceived uncertainty. Once the basic cognitive processing of problem-solvers is intervened with the higher-order information processing (i.e. APS adoption), higher quality decisions are obtained with a higher likelihood of strategic capabilities achievement such as continuous improvement and

organizational learning. The proposed model could be also helpful to mitigate “*IPS dominance*” to cope with problems at both shop-floor and strategic level of the firm.

## **6. Conclusion**

Adopting a cognitive perspective, this study makes a clear distinction between two behavior modes (IPS and APS) for managerial decisions and operational problems. However, we focus on APS as a superior behavior mode and explore its supporting factors along with the enabling conditions of this behavior mode. Doing so sheds some lights to develop our understanding of the successful APS adoption to maintain and improve the business outcomes at both operational and managerial levels of the organizations.

This study, unlike many other types of research in this stream, is not about presenting new tools and techniques for problem-solving. Instead, our core argument is that organizational-specific characteristics and environmental setting can affect the cognitive attitudes of problem-solvers for the way ill-structured problems are dealt with successfully adopting APS. To our understanding, this study is an original attempt to address organizational, environmental and problem nature-related factors that favor APS adoption. This, in turn, sheds light on “*IPS dominance*”, as a higher tendency of problem-solvers to adopt IPS, and deepens our knowledge regarding why many organizations fail or struggle a lot to implement APS for their problems and decisions.

This study also has some considerable implications for managers. It provides valuable information for the leaders regarding the major reasons of APS failure at work-place and articulates a useful guideline about the circumstances through which they are able to get the most out of this behavior mode.

However, the study, like any other one, is not exempt from limitations. We utilized a document co-citation analysis which is based on a premise that most cited articles are more influential than those with lower citation number (Culnan, 1986). Consequently, relevant but recently published articles should be dropped out from study sample due to the lower citation number. This could reduce the reliability of our review though (Vogel & Güttel, 2013). Furthermore, this study presents a review based on the selection of articles published only in top journals that may also restrict our findings. There is also a critical question remains to be explored for future studies. Proposed conceptual model to reinforce APS adoption draws up an interesting agenda for empirical investigation.

## 7. References

- Abdulrahman, M. D. A., Subramanian, N., Liu, C., & Shu, C. (2015). Viability of remanufacturing practice: A strategic decision making framework for Chinese auto-parts companies. *Journal of Cleaner Production*, *105*, 311–323.
- Ackoff, R. L. (1981). On the use of models in corporate-planning. *Strategic Management Journal*, *2*(4), 353–359.
- Alexiev, A. S., Jansen, J. J. P., Van den Bosch, F. A. J., & Volberda, H. W. (2010). Top management team advice seeking and exploratory innovation: The moderating role of TMT heterogeneity. *Journal of Management Studies*, *47*(7), 1343–1364.
- Amason, A. (1996). Distinguishing the effects of functional and dysfunctional conflict on strategic decision making: Resolving a paradox for top management teams. *Academy of Management Journal*, *39*(1), 123–148.
- Argyris, C. (1976). Single-loop and double-Loop models in research on decision making. *Administrative Science Quarterly*, *21*(3), 363–375.
- Armstrong, J. S. (1982). The value of formal planning for strategic decisions : Review of empirical research. *Strategic Management Journal*, *3*(3), 197–211.
- Ashmos, D. P., Duchon, D., & McDaniel, J. R. R. (1998). Participation in strategic decision making: The role of organizational predisposition and issue. *Decision Sciences*, *29*(1), 25–51.
- Ashmos, D. P., & McDaniel, R. R. (1996). Understanding the participation of critical task specialists in strategic decision making. *Decision Sciences*, *27*(1), 103–121.
- Astor, T., Morales, M., & Repenning, N. (2016). What problem are you trying to solve: An Introduction to structured problem solving. *MITSloan School of Management, Working Paper*.
- Baer, M., Dirks, K., T., & Nickerson, J., A. (2013). Microfoundations of strategic problem formulation.

- Strategic Management Journal*, 34, 197–214.
- Baum, J. R., & Wally, S. (2003). Strategic decision speed and firm performance. *Strategic Management Journal*, 24(11), 1107–1129.
- Beer, M., Eisenstat, R., & Spector, B. (1990). Why change programs don't produce change. *Harvard Business Review*, 68(6), 158–166.
- Bohn, R. (2000). Stop fighting fires. *Harvard Business Review*, 83–91.
- Bourgeois, L. J., & Eisenhardt, K. M. (1988). Strategic decision processes in high velocity environments: Four cases in the microcomputer industry. *Management Science*, 34(7), 816–835.
- Büyükdamgaci, G. (2003). Process of organizational problem definition: How to evaluate and how to improve. *Omega*, 31(4), 327–338.
- Chen, J. Q., & Lee, S. M. (2003). An exploratory cognitive DSS for strategic decision making. *Decision Support Systems*, 36(2), 147–160.
- Child, J., & Rodrigues, S. B. (2011). How organizations engage with external complexity: A political action perspective. *Organization Studies*, 32(6), 803–824.
- Choo, A. S. (2014). Defining problems fast and slow: The U-shaped effect of problem definition time on project duration. *Production and Operations Management*, 23(8), 1462–1479.
- Choo, A. S., Nag, R., & Xia, Y. (2015). The role of executive problem solving in knowledge accumulation and manufacturing improvements. *Journal of Operations Management*, 36, 63–74.
- Clark, K. D., & Maggitti, P. G. (2012). TMT potency and strategic decision-making in high technology firms. *Journal of Management Studies*, 49(7), 1168–1193.
- Cray, D., Mallory, G. R., Butler, R. J., Hickson, D. J., & Wilson, D. C. (1988). Sporadic, fluid and constricted processes: Three types of strategic decision making in organizations. *Journal of Management Studies*, 25(1), 13–39.
- Culnan, M. J. (1986). The intellectual development of management information systems , 1972-1982 : A co- citation analysis. *Management Science*, 32(2), 156–172.
- Danese, P., Manfè, V., & Romano, P. (2018). A systematic literature review on recent lean research: State-of-the-art and future directions. *International Journal of Management Reviews*, 20(2), 579–605.
- Das, T. K., & Teng, B.-S. (1999). Cognitive biases and strategic decision processes: An integrative perspective. *Journal of Management Studies*, 36(6), 757–778.
- De Mast, J. (2011). The tactical use of constraints and structure in diagnostic problem solving. *Omega*, 39(6), 702–709.
- De Mast, J., & Lokkerbol, J. (2012). An analysis of the Six Sigma DMAIC method from the perspective of problem solving. *International Journal of Production Economics*, 139(2), 604–614.
- Dean, J., W., & Sharfman, M., P. (1996). Does decision process matter? A study of strategic decision-making effectiveness. *Academy of Management Journal*, 39(2), 368–396.
- Donaldson, R., M. (1972). Systematic problem solving. *Management Review-Condensed from Journal of Systems Management*, 48–50.
- Dooley, R. S., & Fryxell, G. E. (1999). Attaining decision quality and commitment from dissent: The

- moderating effects of loyalty and competence in strategic decision-making teams. *Academy of Management Journal*, 42(4), 389–402.
- Dooley, R. S., Fryxell, G. E., & Judge, W. Q. (2000). Belaboring the not-so-obvious: Consensus, commitment, and strategy implementation speed and success. *Journal of Management*, 26(6), 1237–1257.
- Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly*, 17(3), 313–327.
- Dutton, J. E., Fahey, L., & Narayanan, V. K. (1983). Toward understanding issue diagnosis. *Strategic Management Journal*, 4, 307–323.
- Easton, G. S., & Rosenzweig, E. D. (2012). The role of experience in six sigma project success: An empirical analysis of improvement projects. *Journal of Operations Management*, 30, 481–493.
- Eisenhardt, K. M. (1999). Strategy as strategic decision making. *Sloan Management Review*, 40(3), 65.
- Eisenhardt, K. M., & Bourgeois, L. J. (1988). Politics of strategic decision making in high-velocity environments : Toward a midrange theory. *Academy of Management Journal*, 31(4), 737–770.
- Eisenhardt, K. M., & Zbaracki, M. J. (1992). Strategic decision making. *Strategic Management Journal*, 13, 17–37.
- Elbanna, S. (2012). Slack, planning and organizational performance: Evidence from the Arab middle east. *European Management Review*, 9(2), 99–115.
- Elbanna, S., & Child, J. (2007). Influences on strategic decision effectiveness: Development and test of an integrative model. *Strategic Management Journal*, 28, 431–453.
- Elbanna, S., & Child, J. (2007). The influence of decision, environmental and firm characteristics on the rationality of strategic decision-making. *Journal of Management Studies*, 44(4), 561–591.
- Elenkov, D. (1997). Strategic uncertainty and environmental scanning: the case for institutional influences on scanning behavior. *Strategic Management Journal*, 18(4), 287–302.
- Ellspermann, S. J., Evans, G. W., & Basadur, M. (2006). The impact of training on the formulation of ill-structured problems. *Omega*, 35(2), 221–236.
- Evans, J. S. B. T., & Stanovich, K. E. (2013). Dual-process theories of higher cognition: Advancing the debate. *Perspectives on Psychological Science*, 8(3), 223–241.
- Fahey, L. (1981). On strategic management decision processes. *Strategic Management Journal*, 2(1), 43–60.
- Fredrickson, J. W. (1984). The comprehensiveness of strategic decision processes: Extension, observations, future directions. *The Academy of Management Journal*, 27(3), 445–466.
- Fredrickson, J. W., & Iaquinto, A. L. (1989). Inertia and creeping rationality in strategic decision processes. *Academy of Management Journal*, 32(3), 516–542.
- Fredrickson, J. W., & Mitchell, T. R. (1984). Strategic decision processes: Comprehensiveness and performance in an industry with an unstable environment. *Academy of Management Journal*, 27(2), 399–423.
- Frei, F. (2007). Conventional wisdom “ Don’t bring me problems-bring me solutions!” *Harvard Business Review*, 3.

- Garvin, D., A. (1993). Building a learning organization. *Harvard Business Review*, 78–91.
- Gray, P. H. (2001). A problem-solving perspective on knowledge management practices. *Decision Support Systems*, 31(1), 87–102.
- Grundy, T., & Wensley, R. (1999). Strategic behaviour: The driving force of strategic management. *European Management Journal*, 17(3), 326–334.
- Heavey, C., Simsek, Z., Roche, F., & Kelly, A. (2009). Decision comprehensiveness and corporate entrepreneurship: The moderating role of managerial uncertainty preferences and environmental dynamism. *Journal of Management Studies*, 46(8), 1289–1314.
- Helfat, C. H., & Peteraf, M., A. (2015). Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strategic Management Journal*, 36(2), 831–850.
- Hitt, M. A., & Tyler, B. B. (1991). Strategic decision models : integrating different perspectives. *Strategic Management Journal*, 12(5), 327–351.
- Ho, J. K. K., & Sculli, D. (1997). The scientific approach to problem solving and decision support systems. *International Journal of Production Economics*, 48, 249–257.
- Hodgkinson, G. P., Bown, N. J., Mauler, A. J., Glaister, K. W., & Pearman, Alan, D. (1999). Breaking the frame: An analysis of strategic cognition and decision making under uncertainty. *Strategic Management Journal*, 20, 977–985.
- Hough, J. R., & White, M. A. (2003). Environmental dynamism and strategic decision-making rationality: An examination at the decision level. *Strategic Management Journal*, 24(5), 481–489.
- Hua, C., & Yang, C. (2011). The intellectual development of the technology acceptance model : A co-citation analysis. *International Journal of Information Management*, 31(2), 128–136.
- Iaquinto, A. L., & Fredrickson, J. W. (1997). Top management team agreement about the strategic decision process : A test of some of its determinants and consequences. *Strategic Management Journal*, 18, 63–75.
- Isenberg, D. J. (1986). Thinking and managing: A verbal protocol analysis of managerial problem solving. *The Academy of Management Journal*, 29(4), 775–788.
- Jemison, D. B. (1981). Organizational versus environmental sources of influence in strategic decision making. *Strategic Management Journal*, 2(1), 77–89.
- Judge, W., & Miller, A. (1991). Antecedents and outcomes of decision speed in different environmental contexts. *Academy of Management Journal*, 34(2), 449–463.
- Keats, B., W. (1991). An empirical investigation of strategic investment decision models. *Strategic Management Journal*, 12(3), 243–250.
- Kukalis, S. A. L. (1991). Determinants of strategic planning systems in large organizations: A contingency approach. *Journal of Management Studies*, 28(2), 143–160.
- Langley, A. (1990). Patterns in the use of formal analysis in strategic decisions. *Organization Science*, 11(1), 17–45.
- Laureiro-Martinez D., Brusoni S., 2018, Cognitive Flexibility and Adaptive Decision-Making: Evidence from a laboratory study of expert decision-makers, *Strategic Management Journal*, *Forthcoming*.
- Levinthal, D., A. (2011). A behavioral approach to strategy—What’s the alternative? *Strategic*

- Management Journal*, 32(2), 1517–1523.
- Longenecker, Scazzero, & Stansfield. (1994). Quality improvement through team goal setting , feedback , and problem solving. *International Journal of Quality & Reliability Management*, 11(4), 45–52.
- Lucy, A. A., Richard, L. P., & Hermann Achidi, N. (2005). A CEO-adviser model of strategic decision making. *Journal of Management*, 31(5), 680.
- Lyles, M. (1981). Formulating strategic problems: empirical analysis and model development. *Strategic Management Journal*, 2, 61–75.
- Lyles, M. A. (1987). Defining strategic problems: Subjective criteria of executives. *Organization Studies*, 8(3), 263–280.
- Lyles, M. A. (2014). Organizational learning , knowledge creation , problem formulation and innovation in messy problems. *European Management Journal*, 32(1), 132–136.
- Lyles, M., A., & Thomas, H. (1988). Strategic problem formulation: Biases and assumptions embedded in alternative decision-making models. *Journal of Management Studies*, 25(2), 131–145.
- Mac Duffie, J. . (1997). The road to “rootcause”: shop-floor problem solving at three auto assembly plants. *Management Science*, 43(4), 479–502.
- Macher, J. T. (2006). Technological development and the boundaries of the firm: A knowledge-based examination in semiconductor manufacturing. *Management Science*, 52(6), 826–843.
- Macpherson, A., & Jones, O. (2010). Editorial: Strategies for the development of International Journal of Management reviews. *International Journal of Management Reviews*, 12(2), 107–113.
- Marksberry, P., Badurdeen, F., Gregory, B., & Kreamfle, K. (2010). Management directed kaizen: Toyota’s Jishuken process for management development. *Journal of Manufacturing Technology Management*, 21(6), 670–686.
- Marksberry, P., Bustle, J., & Clevinger, J. (2011). Problem solving for managers: a mathematical investigation of Toyota’s 8-step process. *Journal of Manufacturing Technology Management*, 22(7), 837–852.
- Martinsons, M., Davison, R., & Tse, D. (1999). The balanced scorecard: a foundation for the strategic management of information systems. *Decision Support Systems*, 25(1), 71–88.
- Mccain, K. W. (1990). Mapping authors in intellectual space: A technical overview, 41(6), 433–443.
- McKenzie, J., Woolf, N., Winkelen, C. van, & Morgan, C. (2009). Cognition in strategic decision making. *Management Decision*, 47(2), 209–232.
- Miller, C. C., Burke, L. M., & Glick, W. H. (1998). Cognitive diversity among upper-echelon executives : Implications for strategic decision processes. *Strategic Management Journal*, 19(1), 39–58.
- Miller, S. (1997). Implementing strategic decisions: Four key success factors. *Organization Science*, 18(4), 577–602.
- Miller, C., C. (2008). Decisional comprehensiveness and firm performance: Towards a more complete understanding. *The Journal of Behavioral Decision Making*, 27, 179–189.
- Mintzberg, H., Raisinghani, D., & Theoret, A. (1976). The structure of “ unstructured ” decision processes. *Administrative Science Quarterly*, 21(2), 246–275.
- Mitchell, R. J., Shepherd, D. A., & Sharfman, M. P. (2011). Erratics strategic decisions: When and why

- managers are inconsistent in strategic decision making. *Strategic Management Journal*, 704, 683–704.
- Morrison, B. (2015). The problem with workarounds is that they work: The persistence of resource shortages. *Journal of Operations Management*, 39-40, 79–91.
- Mueller, G. C., Mone, M. a., & Barker, V. L. (2007). Formal strategic analyses and organizational performance: decomposing the rational model. *Organization Studies*, 28(6), 853–883.
- Myszewski, J. M. (2013). On improvement story by 5 whys. *The TQM Journal*, 25(4), 371–383.
- Nerur, S. P., Rasheed, A. A., & Natarajan, V. (2008). The intellectual structure of the strategic management field: An author co-citation analysis. *Strategic Management Journal*, 29, 319–336.
- Nickerson, J. A., & Zenger, T. R. (2004). A knowledge-based theory of the firm: The problem-solving perspective. *Organization Science*, 15(6), 617–632.
- Nutt, P. C. (1984). Types of organizational decision processes. *Administrative Science Quarterly*, 29(3), 414–450.
- Nutt, P. C. (1998). Evaluating alternatives to make strategic choices. *Omega*, 26(3), 333–354.
- Nutt, P. C. (1998). Framing strategic decisions. *Organization Science*, 9(2), 195–216.
- Olson, B. J., Parayitam, S., & Yongjian Bao. (2007). Strategic decision making: The effects of cognitive diversity, conflict, and trust on decision outcomes. *Journal of Management*, 33(2), 196–222.
- Papadakis, V. M., Lioukas, S., & Chambers, D. (1998). Strategic decision-making processes: The role of management and context. *Strategic Management Journal*, 19, 115–147.
- Papke-Shields, K. E., & Malhotra, M. K. (2001). Assessing the impact of the manufacturing executive's role on business performance through strategic alignment. *Journal of Operations Management*, 19(1), 5–22.
- Powell, T. C. (1995). Total quality management as competitive advantage: A review and empirical study. *Strategic Management Journal*, 16, 15–37.
- Preston, D. S., Chen, D., & Leidner, D. E. (2008). Examining the antecedents and consequences of CIO strategic decision-making authority: An empirical study. *Decision Sciences*, 39(4), 605–642.
- Priem, R. L., Rasheed, A., M., A., & Kotulic, A., G. (1995). Rationality in strategic decision processes, environmental dynamism and firm performance. *Journal of Management*, 21(5), 913–929.
- Ramaprasad, A., & Mitroff, I. I. (1984). On formulating strategic problems. *Academy of Management Review*, 9(4), 597.
- Ramos-Rodríguez, A.-R., & Ruiz-Navarro, J. (2004). Changes in the intellectual structure of strategic management research : A bibliometric study of the “ strategic management journal ”, 1980-2000. *Strategic Management Journal*, 25(10), 981–1004.
- Repenning, N. P., & Serman, J. D. (2002). Capability traps and self-confirming attribution errors in the dynamics of process improvement. *Administrative Science Quarterly*, 47(2), 265–295.
- Rindova, V. P. (1999). What corporate boards have to do with strategy: A cognitive perspective. *Journal of Management Studies*, 36(7), 953–975.
- Rodriguez, S., B., & Hickson, D. J. (1995). Success in decision making: different organizations, different reasons for success. *Journal of Management Studies*, 32(5).

- Sage, A. P. (1981). Behavioral and organizational considerations in the design of information systems and processes for planning and decision support. *IEEE Transactions on Systems, Man, and Cybernetics, SMC-11*(9), 640–678.
- Schmidt, J. B., Montoya-Weiss, M. M., & Massey, A. P. (2001). New product development decision-making effectiveness: comparing individuals, face-To-face teams, and virtual teams. *Decision Sciences, 32*(4), 575–600.
- Schroeder, R. G., Linderman, K., Liedtke, C., & Choo, A. S. (2008). Six Sigma: Definition and underlying theory. *Journal of Operations Management, 26*(4), 536–554.
- Schwenk, C. R. (1988). The cognitive perspective on strategic decision making. *Journal of Management Studies, 25*(1), 41–55.
- Schwenk, C. R. (1995). Strategic decision making. *Journal of Management, 21*(3), 471–493.
- Sharfman, M. P., & Dean, J. W. (1997). Flexibility in strategic decision making: Informational and ideological perspectives. *Journal of Management Studies, 34*(2), 191–217.
- Smith, G. F. (1988). Towards a heuristic theory of problem structuring. *Management Science, 34*(12), 1489–1507.
- Smith, G. F. (1989). Defining managerial problems: A framework for prescriptive theorizing. *Management Science, 35*(8), 963–981.
- Söderlund, J., & Borg, E. (2017). Liminality in Management and Organization Studies: Process, Position and Place. *International Journal of Management Reviews, 00*, 1–23.
- Spear, S. J. (2004). Learning to lead at Toyota. *Harvard Business Review*.
- Staats, B. R., Brunner, D. J., & Upton, D. M. (2011). Lean principles, learning, and knowledge work: Evidence from a software services provider. *Journal of Operations Management, 29*(5), 376–390.
- Subramoniam, R., Huisingh, D., & Chinnam, R. B. (2009). Remanufacturing for the automotive aftermarket-strategic factors: Literature review and future research needs. *Journal of Cleaner Production, 17*, 1163–1174.
- Subramoniam, R., Huisingh, D., & Chinnam, R. B. (2010). Aftermarket remanufacturing strategic planning decision-making framework: Theory & practice. *Journal of Cleaner Production, 18*, 1575–1586.
- Tarantini, M., Pernigotto, G., & Gasparella, A. (2017). A co-citation analysis on thermal comfort and office buildings. *Building Review Journal, 7*(36), 1–17.
- Thomas, H. (1984). Strategic decision analysis : Applied decision analysis and its role in the strategic management process. *Strategic Management Journal, 5*, 139–156.
- Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management, 14*, 207–222.
- Tsang, E. W. K. (2004). Toward a scientific inquiry into superstitious business decision-making. *Organization Studies, 25*(6), 923–946.
- Tucker, A. L., & Edmondson, A. C. (2003). Why hospitals don't learn from failures: *California Management Review, 45*(1), 55–72.

- Tucker, A. L., Edmondson, A. C., & Spear, S. (2002). When problem solving prevents organizational learning. *Journal of Organizational Change Management*, 15(2), 122–137.
- Tuggle, F. D., & Gerwin, D. (1980). An information processing model of organizational perception, strategy and choice. *Management Science*, 26(6), 575–592.
- Turner, K., L., & Makhija, M., V. (2012). The role of individuals in the information processing perspective. *Strategic Management Journal*, 33(2), 661–680.
- Vogel, R., & Güttel, W. H. (2013). The dynamic capability view in strategic management: A bibliometric review. *International Journal of Management Reviews*, 15(4), 426–446.
- Volkema, R. J. (1983). Problem formulation in planning and design. *Management Science*, 29(6), 639–652.
- Volkema, R. J. (1986). Problem formulation as a purposive activity. *Strategic Management Journal*, 7, 267–279.
- Volkema, R. J., & Gorman, R. H. (1998). The influence of cognitive-based group composition on decision-making process and outcome. *Journal of Management Studies*, 35(1), 105–121.
- Walker, E. D., & Cox, J. F. (2006). Addressing ill-structured problems using Goldratt’s thinking processes: A white collar example. *Management Decision*, 44(1), 137–154.
- Wang, C. L., & Chugh, H. (2014). Entrepreneurial learning: Past research and future challenges. *International Journal of Management Reviews*, 16(1), 24–61.
- Werder, A. V. (1999). Argumentation rationality of management decisions. *Organization Science*, 10(5), 672–690.
- Wolfe, J., & Jackson, C. (1987). Creating models of the strategic decision making Process via participant recall: A free simulation examination. *Journal of Management*, 13(1), 123–134.
- Wright, G., & Goodwin, P. (2002). Eliminating a framing bias by using simple instructions to “think harder” and respondents with managerial experience: Comment on “breaking the frame”. *Strategic Management Journal*, 23(11), 1059–1067.
- Zehir, C., & Özsahin, M. (2008). A field research on the relationship between strategic decision-making speed and innovation performance in the case of Turkish large-scale firms. *Management Decision*, 46(5), 709–724.

# The Dynamics of Operational Problem-Solving: A Dual-Process Approach<sup>4</sup>

**Abstract-** This study establishes the micro-foundations of two distinct behavior modes in the context of operational problem-solving. More specifically, we explicate how decision makers cope with problems by studying potential behavior modes from a cognitive perspective. Drawn from dual-process theory, the first behavior mode is based on heuristic reasoning to eliminate problem symptoms whereby problem-solvers work around the problems employing short-term remedies and prompt fixes to temporarily solve a problem. The second mode relies on structured reasoning aimed at solving the problem fundamentally with the help of structured corrective actions. We label them as intuitive and analytical problem-solving respectively (IPS and APS). Although the effectiveness of APS to achieve sustainable success is asserted in the literature, problem-solvers are more likely to adopt IPS, a phenomenon that is called “*IPS dominance*”. Motivated by field work at a manufacturing plant, we develop a system dynamics model to scrutinize these two behavior modes in separation as well as transition dynamics between them to shed light on the major reasons of “*IPS dominance*”.

**Keywords:** Problem-Solving, Dual-Process Theory, System Dynamics, Simulation

## 1. Introduction

In general, a problem is defined as a deviation from the desired outcome (Choo, 2014; Baer et al., 2013; Spear & Bowen, 1999; Smith, 1988; Bartee, 1973). Problem-solving is considered an important capability of firms to quickly respond to changes and to seek organizational learning and continuous improvement opportunities (Astor et al., 2016; Choo et al., 2015; Koskinen, 2012;

---

<sup>4</sup> Mohagheh, M. & Größler, A. “ The Dynamics of Operational Problem-solving: a Dual-Process Approach. 25<sup>th</sup> International EurOMA Conference, Budapest, 24-26 June 2018.

Tucker & Edmondson, 2003; Tucker et al., 2002; Gray, 2001; Mac Duffie, 1997; Garvin, 1993) . Potentially, people and organizations as problem-solving entities learn from problems and failures that are successfully overcome. However, there is a considerable consensus among researchers that not every problem-solving activity leads to sustainable organizational success (Choo et al., 2015; Morrison, 2015; Repenning & Sterman, 2002; Tucker et al., 2002; Argyris, 1976; Donaldson, 1972). In this study, we define problem-solving as a pattern of individual decisions aimed at solving a problem and, in line with the literature, we make a clear distinction between either fixing the problem by just removing the symptoms or overcoming it through diagnosing and altering underlying causes. This distinction matters as they are two different ways with totally different characteristics to tackle problems. Drawing from dual-process theory (Evans & Stanovich, 2013), one behavior mode is based on intuitive reasoning, whereby problem-solvers work around problems employing short-term remedies and prompt fixes to temporarily solve them. Intuitive problem-solvers look for the most satisfactory solution with minimal cognitive efforts. This occurs through remediating the negative effects while neglecting the real causes of a problem. The other behavior mode relies on analytical reasoning to solve the problem fundamentally using structured corrective actions. This behavior mode requires deliberate and reflective cognitive efforts to go through a series of stages for problem analysis (i.e. problem definition, problem scrutiny, generation of alternatives, and solution design) before the final decision is reached. We label these behavior modes as intuitive problem-solving (IPS hereafter) and analytical problem-solving (APS hereafter), respectively, for two main reasons.

First, despite a clear separation between them, there are no commonly-used terms for them in the literature. A plethora of terms is used to indicate different problem-solving modes such as first-order and second-order problem-solving (Tucker et al., 2002), symptomatic and generative

problem-solving (Choo et al., 2015), first-order and second-order improvements (Repenning & Sterman, 2002), front-line mechanism, i.e. workarounds and managerial intervention, i.e. resource allocation, (Morrison, 2015), single loop and double loop learning (Argyris, 1976), or amateur and professional problem-solving (Donaldson, 1972). Also, in the strategic management literature, incrementalism and rationality (or comprehensiveness) refer to the same behavior modes for dealing with strategic decisions (Priem et al., 1995; Schwenk, 1995).

Second, IPS and APS, as the words imply, provide a clear and comprehensive explanation regarding the nature of each behavior mode, from a cognitive perspective. APS refers to a behavior mode which is based upon an individual's analytical skills and logical reasoning that leads to an appropriate solution, whereas IPS activates an individual's intuition as the basic cognitive processing to react quickly to the problem.

The aim of this study is twofold. First, to characterize and to scrutinize IPS and APS, as potential behavior modes for operational problem-solving, by discussing the micro-foundations of each. Although IPS and APS are discussed in the management literature, little attention is given to open the "black boxes" of these behavior modes and thus existing studies fail to articulate their micro-foundations. In line with a description provided by Baer et al., (2013), we use the term "micro-foundations" to analyze the main structural components of these problem-solving behavior modes and discover the interactions among key variables that create the aggregate phenomena of IPS and APS. In this regard, we unpack IPS and APS and illustrate how they might contribute to the operational effectiveness. The second purpose of this study is to explore the circumstances by which one behavior mode is preferred over the other. More specifically, although the effectiveness of APS to achieve sustainable success is well-documented in the literature (i.e. resulting in a lower probability of re-appearance, contribution to strategic capabilities such as organizational learning

and continuous improvement, and consequently the amelioration of firm performance), problem-solvers are more likely to adopt IPS, a phenomenon that is called “*IPS dominance*” (Baer et al., 2013; Repenning & Sterman, 2002; Tucker et al., 2002; Tucker & Edmondson, 2003). Therefore, this study also seeks the major reasons that reinforce the likelihood of IPS adoption and limit APS adoption in the context of operational problem-solving.

In order to understand the causes and circumstances of problem-solving activities in companies, we conducted a case-study. The research site was a manufacturer of gardening equipment and supplier of agricultural products. This setting is of relevance for our study because operational problems related to cost, quality and delivery of the products occur frequently and as a consequence we expect IPS and APS, as two potential problem-solving behavior mode, to be relatively easy to detect. Data collection included direct observations of problem-solvers at different level (e.g. shop-floor employees and plant supervisors), and semi-structured interviews to realize how problems are dealt with. We also relied on the memory of interviewees to provide historical information regarding the nature of problems previously solved.

Based on insights from the studied company, IPS and APS are clarified by explicating the causal structure of each. We propose the main components and develop their relationships with barriers and enablers of each behavior mode in form of causal diagrams. Then, the causal diagrams, representing IPS and APS, are translated into formal simulation models following the system dynamics method. Doing so helps to gain an enriched understanding of the dynamic behavior, in particular the performance effects of each behavior mode. In addition, we propose an integrated model which links IPS and APS to provide a more comprehensive picture of operational problem-solving. Based on simulation results, we address “*IPS dominance*” and highlight three main reasons for this phenomenon. The first one is high problem urgency, due to time pressure, which

forces problem-solvers to work around the problem without adequate analysis. The second one, related to the characteristics of senior executives, is introduced as managers with short-term horizon who emphasize immediate success rather than sustained development. In this case, managerial intervention for APS (i.e. allocating resources and encouraging team-work) seems insufficient and, as a consequence, the analytical reasoning mode of problem-solvers is restrained with IPS dominating. The third reason of “*IPS dominance*” is recognized as insufficient organizational antecedents for a successful APS adoption. In other words, we highlight a set of organizational factors (i.e. managerial awareness, organizational resources, collaborative culture) for APS to be effective and hence we claim that a lack of attention to establish and maintain these factors could eventually lead IPS to take precedence over APS.

This paper, unlike other efforts in this field, is not about presenting novel tools and techniques to support problem-solving. Instead, drawn from dual-process theory, we study two distinct cognitive approaches for operational problems and develop causal model that simultaneously captures the dynamics of the two problem-solving modes in separation as well as transition dynamics between these two. We believe that this study contributes to a body of literature where a rational-comprehensive approach is emphasized to deal with setbacks, problems and decisions (e.g. operations management and strategic management). For APS adoption, although there are various well-established strategies and techniques such as lean manufacturing and Six Sigma DMAIC in the operations management literature to support this behavior mode, we attempt to unravel the black-box of APS through an organizational learning lens to understand the key variables, the relationships among them as well as the barriers and enablers of it. Also, we shed some light on the question why many firms fail to get the most out of APS or struggle to achieve sustainable APS outcomes over time.

This work also has considerable implications for the managers. It provides insightful information to address the circumstances through which IPS and APS perform effectively. This could enable senior executives to design appropriate problem-solving strategies and relevant policies to successfully cope with the problems.

The remainder of the paper proceeds as follows. Section 2 describes the case study setting, in particular data collection and analysis. Based on this data, in section 3, we discuss the relevant literature and then develop the conceptual models in the form of causal diagrams for each behavior mode. Section 4 presents the main findings of the study on the basis of simulation studies of formal causal models of the two behavior modes. In section 5, we summarize the main findings regarding theory-based micro-foundations of IPS and APS as well as “*IPS dominance*” and its major reasons. Finally, section 6 concludes with theoretical contributions, managerial implications, limitations and potential questions to be further explored.

## **2. Case study: Operational Problem-Solving in Practice**

Problem-solving, in general, is a dynamic process which can be very complex in terms of structure, feedback loops, and information (Sterman, 2000). To simplify the complexity and in order to understand the proximal causes and circumstances of problem-solving activities in real world, we conducted a case-study following a five-stage process proposed by Stuart et al. (2002) (i.e. research question definition → instrument development → data collection → data analysis → dissemination). Yin (1981) suggests explanatory case-studies for an accurate rendition of the facts. This type of case-study seems appropriate to analyze the micro-foundations of problem-solving behavior modes (e.g. what are the core elements of IPS and APS?) and to discover the major reasons for “*IPS dominance*” (e.g. why does it occur?).

The research site was a manufacturing plant of gardening equipment and a supplier of agricultural products. This research setting was of particular interest for two reasons. First, operational problems mainly related to cost, quality and delivery of the products occur frequently and, as a consequence, we could observe the way these problems are dealt with (Morrison, 2015; Reppenning & Sterman, 2002; Mac Duffie, 1997). Second, the general manager of the firm started emphasizing improvement-based programs (e.g. lean manufacturing and its bundles such as JIT or TQM) due to an increasing trend of complaints based on customer dissatisfaction together with reports about the low efficiency of the assembly line (e.g. high defects rate, warehousing problems, and inability to reach the production target). Therefore, the case study company provided a good opportunity to observe the problem-solving activities of individuals such as shop-floors employees and assembly line supervisors. Initially, one of the researchers outlined the project aims in a briefing meeting with the CEO and the general manager of the firm. Then, data was gathered, over a period of three months, on the actual problem situation and we investigated the behavior of individuals engaged in problem-solving activities.

For data collection, in order to ensure the accuracy of the judgments and reliability of data, data triangulation is emphasized. This technique means to validate the data through different sources of information (Gibbert et al., 2008; Stuart et al., 2002; Jick, 1979). This study relied upon three main sources. First, direct observations through several days of shadowing the line supervisors, warehouse manager, and roaming the shop-floor employees. This way to gather data is quite common to acquire a comprehensive picture of problem-solving activities in the studied company (e.g. Morrison, 2015; Reppenning & Sterman, 2002; Mac Duffie, 1997). Moreover, observations, compared to other methods for data collection, is considered as a powerful technique to indicate causal relationships among the key variable of the studied phenomenon (Stuart et al., 2002). For

the second source of data collection, we conducted semi-structured interviews with not only the members of the top management team including the plant manager but also shop-floor employees. In general, semi-structured interviews are flexible and additional explanations could be provided (Lyles & Mitroff, 1980). This, indeed, assisted us to obtain the complete and rich information from problem-solving informants. The interviews began by asking the respondents to identify the most important and frequent problems as well as the reasons to consider them as problems. These open-ended questions allowed us to keep the participants talking and engaged in the interview. For example, one problem pointed out by almost every interviewee, was assembly line inefficiency. They recognize it as an important problem due to its frequency and the cost imposed to the system. Then, they were asked to describe the actions they had taken to overcome the highlighted problems. This provided an opportunity to obtain a general impression of the company and the way problem-solvers approached and responded to problems. Interviews approximately took from 15 minutes to 2 hours. These two sources of data collection seemed to be supplementary and corroborate our data (Tyre, 1995). The third source of data collection was to rely on the memory of respondents to provide historical information regarding the most important problems and their frequencies as well as the ways previous problems were coped with. As noted earlier, the studied company recently put the emphasis on the process improvement strategies and techniques. So, we count on a premise that the firm previously struggled a lot for solving the problems fundamentally. However, this type of interviews was just limited to the people in top management team. This, indeed, illustrated how similar problems are dealt with before and after the implementation of improvement-based programs. A sample question for the plant manager was, for example, “When and how did you get informed about a problem occurred in the assembly line?”.

Data analysis began with reviewing the observational data, gathered in the site visits, and analyzing the notes that were transcribed during the interviews. We linked the way in which a problem was solved with either of the two problem-solving behavior modes. In other words, given a problem-solver's attitude and a set of actions taken, we were able to assess if the problem was either temporarily solved using IPS or fundamentally overcome adopting APS. For each identified problem in the company, we highlighted the characteristics of IPS and APS and determined the key variables in each mode, the causal links among them and the impacts. Then, we made frequent sketches for these potential behavior modes including the key variables and their interactions. These graphical representations resulted in causal diagrams for IPS and APS. To ensure having a comprehensive understanding of problem-solving activities in the company and sharpen its generalizability, we double-checked each link to see whether, or not, the observed relationships between variables are supported by the literature (Eisenhardt, 1989).

Table 1 summarizes the main findings of the case-study, where problems are overcome adopting IPS. We include both general and problem-specific observations. We briefly explain the problem and highlight why identified problem-solving efforts could represent IPS adoption. However, we report the most considerable operational problems, mainly related to cost, quality and delivery of the products in the firm.

Table 1: IPS Observational Results

Observations	Evidence for IPS adoption	Evidence from the Literature (IPS Characteristics)
General Observations	<p>In many cases, front-line employees are behind the defined schedule to meet the daily production target. This low productivity is mostly covered by <i>high rework rate</i>.</p>	<p><i>High rework rate</i> to correct defects (Repenning &amp; Sterman, 2002) or to increase pressure on front-line employees to get work done (Morrison, 2015) is a common response to just remove the problem symptoms rather than exploring the major sources of problems (i.e. process problems).</p>
	<p>“As an experienced person, I’ve faced different types of problems and I know how to deal with them successfully” (assembly line supervisor).</p>	<p>Single-loop learning just by relying on implicit knowledge and personal hypotheses rather than valid information regarding the problem structure (i.e. the main problem and its root-cause). This results in working around the problems (Argyris, 1976).</p>
General Observations	<ul style="list-style-type: none"> <li>▪ “I only inform my supervisor about a failure when I cannot solve it by my-self” (a front-line employee).</li> <li>▪ Errors in shop-floor are rarely reported to the assembly line supervisor. Front-line employees, in many cases, try to hide the problems.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Problem-solvers act as satisfiers. One potential reason could be that front-line employee does not want to be blamed by the supervisor (Tucker &amp; Edmondson, 2003; Brooks, 1994).</li> <li>▪ Organizational learning is difficult to achieve due to a lack of information shared in the firm (Tucker et al., 2002; Garvin, 1993).</li> </ul>
	<p>General manager reports “<i>high holding cost</i>” due to stocking a large number of finished products in the warehouse. The solution he came with was simply to <i>pre-sell</i> the products.</p>	<ul style="list-style-type: none"> <li>▪ IPS, devising <i>prompt fixes</i> and <i>immediate solutions</i>, is adopted for overcoming the highlighted problems.</li> </ul>
Problem-Specific Observations	<p><i>Customer dissatisfaction</i> due to <i>delivery delay</i> is reported as a substantial problem. In many cases, delivery time is more that promised (approximately 25%). The temporary solution proposed is to <i>offer discount</i> in order to make the customers satisfied and prevent the customer loss.</p>	<ul style="list-style-type: none"> <li>▪ This behavior, although helpful to remediate the situation and solve the problem <i>temporarily</i>, creates negative consequences:</li> </ul>
	<p>General manager of the firm claims that, in some cases, the <i>quality of raw material</i> received from the main supplier is not as expected. This leads also to <i>customer complaints</i> regarding the quality of the finished product that imposes a higher cost to the system.</p>	<ul style="list-style-type: none"> <li>• The main cause of the problem becomes hidden (as the result of solving the wrong problem or error type III) and problem re-occurs soon.</li> <li>• It creates additional problems (e.g. higher cost, more rework, and higher pressure, just to name a few examples).</li> </ul>

We also find evidence and provide examples for the problems that are fundamentally solved by the help of structured corrective actions, adopting APS. Table 2 summarizes the most considerable problems solved by APS adoption. We demonstrate why these problem-solving efforts can be considered as APS adoption. It is also worth stipulating that, for some previously-solved problems by IPS, fundamental solutions are employed after upper-managers of the firm stressed on the improvement-based programs by upper-managers.

Table 2: APS Observational Results

Problem	Problem Description	Evidence for APS Adoption	
		Problem Root-Causes	Fundamental Solution
Unbalanced workloads	Assembly line is either over utilized or underutilized.	Production planning is not perfectly done based on customer demands.	To balance the production line, precise production planning is taken as a structured solution to collect valid information regarding the most (least) demanding products, and the seasonal demands to have a better forecast.
Customer complaints due to the poor quality of finished products	In many cases, customer dissatisfaction is recorded. Also, rejected products to the firm is pretty high.	<ul style="list-style-type: none"> <li>▪ Lack of quality control for raw material received from the main supplier.</li> <li>▪ High bargaining power of the supplier that increases pressure on the firm by accepting the low quality of raw materials.</li> </ul>	<ul style="list-style-type: none"> <li>▪ To check and test raw material quality received before assembling.</li> <li>▪ To negotiate with other suppliers in the industry (i.e. not just relying on one supplier).</li> </ul>
High Holding Cost	The general manager of the firm claims that the warehousing operations are not effective.	<ul style="list-style-type: none"> <li>▪ Warehousing is just limited to counting the stocks.</li> <li>▪ There is no plan to store and moving the stocks in a structured way (products are not positioned in the right place at the right time). This causes inconsistencies for counting the products and also sending them out to the end-users.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Just in Time (JIT) is proposed as a potential solution to reduce the high dependency to the warehouse.</li> <li>▪ The layout manager together with the warehouse manager start attempting to improve the warehouse (spacing, and timing).</li> <li>▪ Inventory management techniques such as LIFO (last in first out) and FIFO (first in first out) are suggested under different conditions.</li> </ul>

In this behavior mode, potential causes of the problems are first discussed. Then, based on the identified cause, structured corrective actions are suggested in the team problem-solving sessions. These structured corrective actions, based on valid information to structure the problem (i.e. the main problem and its root-causes), lead to fundamental solutions and eventually bring radical improvements in cost and quality.

### **3. Structural Building Blocks of Problem-Solving Modes**

#### **3.1 Intuitive Problem-Solving (IPS)**

From a cognitive perspective, IPS is based on intuitive reasoning, whereby problem-solvers work around the problems employing short-term remedies and prompt fixes to temporarily solve the problem. Problem-solvers tend to follow this behavior mode by focusing more on a potential solution rather than the problem and its causes. Smith (1989, p.967) addresses this behavior mode as “people often design solution alternatives without having carefully diagnosed the problem’s causes”. In other words, the intermediate steps of a logical problem-solving behavior (i.e. APS) such as problem definition, problem scrutiny and solution design are usually skipped, abbreviated or implemented simultaneously. This behavior mode is also known as fire-fighting (Bohn, 2000; Longenecker et al., 1994) or solution-mindedness (Morrison, 2015; De Mast & Lokkerbol, 2012; Büyükdamgaci, 2003) in the management literature, with problem-solvers devising ready-made-solutions, heuristics and shortcuts in response to the problems. IPS adoption occurs as the result of individuals making decisions based on their prior experiences and existing hypotheses rather than structured actions emerging from rich contextual information (Astor et al., 2016; Baer et al., 2013).

Based on insights from the case-study, we discuss the theory-based micro-foundations of IPS

adoption by demonstrating the causal diagram that explicates the structure including the relationships among the key variables in IPS (Figure 1). Variables and their connections are supported by the literature of problem-solving. This is known as theoretical triangulation, where different theories in the problem-solving literature are employed to bear on this behavior mode (Eisenhardt, 1989; Jick, 1979). The positive (or negative) sign at the arrowhead indicates the polarity of the relationship meaning that the effect is positively (or negatively) related to the cause. In addition, identifier “R” refers to reinforcing or positive feedback loops while identifier “B” represents balancing or negative feedback loops in causal diagrams (see Sterman, 2000).

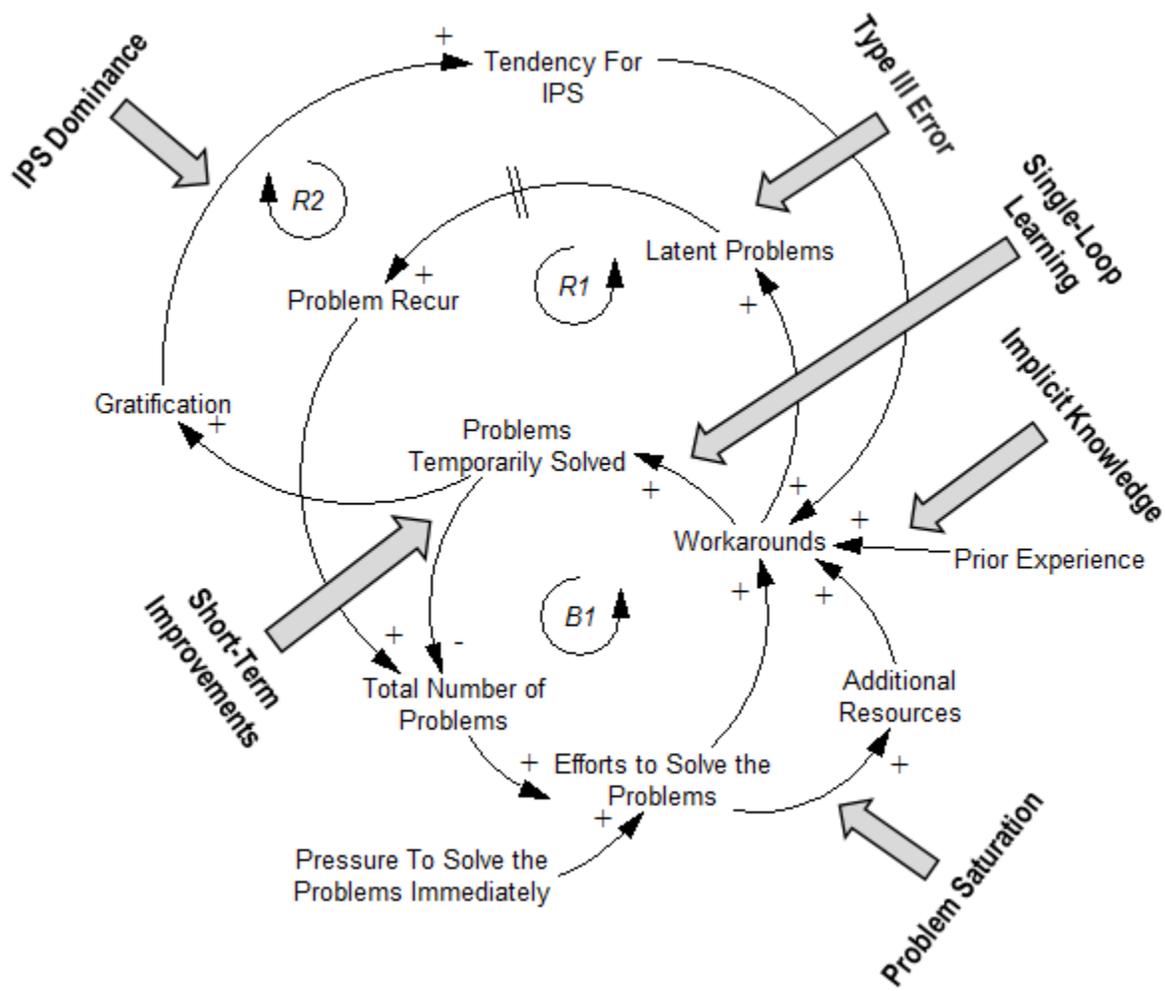


Figure 1: IPS Causal Diagram

The detection of a problem calls attention and triggers a set of actions to overcome the problem faced. However, *efforts to solve the problem* is determined by *total number of problems* in the system and *pressure to solve the problems immediately*. For example, when a problem with extremely high time pressure is perceived by front-line employees, more efforts are required to react quickly to this problem. Morrison (2015) and Repenning & Sterman (2002) characterize IPS as a way to increase pressure on front-line employees to meet the production target without realizing where the production deficit originates from. In a similar vein, it is quite common to hear from top managers that “don’t bring me problems, bring me solutions” (Frei, 2007, p.3). This also imposes additional pressure on employees to immediately resolve the problems. One shop-floor employee, in our study, emphasizes this claim in his words “I only inform my supervisor about my mistake when I cannot correct it by myself”.

In order to alleviate this pressure, shop-floor employees devise *workarounds* (i.e. short-term remedies and prompt fixes) as the most satisfactory solution. To proceed, problem-solvers rely only on their *prior experience* and existing hypotheses as Evans and Stanovich (2013) highlight *implicit knowledge* that is not articulated and codified through collective discussions and debriefing sessions for problem-solving (Zollo & Winter, 2002). This is also in line with the definition provided by Donaldson (1972) to characterize IPS as an amateur approach in problem-solving which rests on personal assumptions and guesswork of problem-solvers. Drawing on the organizational learning literature, Argyris (1976) calls this behavior mode as “*single-loop learning*” where problem-solvers act as satisfiers by just removing the problem symptoms while root-causes are neglected. IPS reduces *the total number of problems* in the system and accordingly results in *short-term* or incremental *improvements* (Choo et al., 2015; Repenning & Sterman, 2002; Tucker et al., 2002). This forms a balancing loop ( $B_1$ ): the more problems solved temporarily from

increasing workarounds, the less problems remain in the system. When the total number of problems exceeds the certain level, called *problem saturation* phase, due to problem accumulation, current employees seem inadequate and *additional resources* should be assigned to control the situation with the high number of problems in the system.

IPS as a solution-mindedness behavior mode, although effective to temporarily solve the problem, might create some unexpected negative consequences. More precisely, since inadequate emphasis is placed on understanding and eliminating the major root-causes of the problem, there is a high likelihood for the problems to recur. The reason is that problem symptoms disappear temporarily because of IPS adoption while the real problem stays uncovered (i.e. *latent problem*). Problem symptoms re-appear with a *delay* as latent problems become visible again. This is interpreted in the literature as solving the wrong problem or error type III (Lyles, 2014; Smith, 1989; Volkema, 1986; Mitroff & Featherirjgham, 1974). Lyles (1981) finds evidence for this fact claiming that in approximately 75 percent of the studied cases on problem formulation, managers had to cycle back to the problem initiation phase due to formulating the wrong problem. This reinforcing loop, labeled  $R_1$ , shows that an increased use of workarounds causes latent problems to increase and the total number of problems to grow.

When a problem is temporarily solved, it brings *gratification* and self-confidence (Tucker & Edmondson, 2003). This could also be observed in our case study when a machine stopped working and the shop-floor employee felt uncomfortable and stressful since he was not able to fix it quickly. As a result of inner gratification, problem-solvers appear to show a higher *tendency for IPS*, the phenomenon that is called "*IPS dominance*" (Baer et al., 2013; Repenning & Sterman, 2002; Tucker et al., 2002; Tucker & Edmondson, 2003) or fire-fighting syndrome (Bohn, 2000; Longenecker et al., 1994). IPS dominance creates an additional willingness to employ

*workarounds* for other problems without considering its negative consequences. This forms another reinforcing loop ( $R_2$ ) as the more *problems temporarily solved*, the higher the level of *gratification* for problem-solvers and, thus, a *higher tendency for IPS* adoption that leads to an increasing number of *workarounds*.

### **3.2 Analytical Problem-Solving (APS)**

Adopting a cognitive perspective, we define APS as a behavior mode which is based on analytical reasoning of individuals in order to fundamentally solve the problem using structured corrective actions. This deliberate and reflective effort assumes a logical and step-wise process to link the observed problem to a diagnosis, and eventually an appropriate solution through a systematic search process (e.g. Astor et al., 2016; Marksberry et al., 2010). Problem scrutiny (i.e. root-cause investigation) refers to a set of actions to clearly understand the real problem and explore and articulate its major sources and plays a substantial role in this behavior mode. There are different techniques, especially in the literature of operations management, to structure this behavior mode such as the PDCA cycle (Plan, Do, Check, Act) or the Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control) where improvement teams are required to (1) identify the right problem to address, (2) determine its potential causes, (3) propose alternative solutions, (4) test the effectiveness of each solution with experiments and, (5) implement the best possible solution (De Mast, 2013; Easton & Rosenzweig, 2012; Schroeder et al., 2008).

The effectiveness of APS adoption is well-promoted in the literature. Scholars associate it directly with the quality of solutions and decisions (Baer et al., 2013; Gray, 2001; Lyles & Thomas, 1988), shop-floor improvements such as defects reduction or productivity enhancement (Longenecker et al., 1994; Marksberry et al., 2011), and ultimately firm-level performance (Marksberry et al., 2011; Schroeder et al., 2008; Volkema & Gorman, 1998). Moreover, it is

emphasized as a major trigger of strategic capabilities such as continuous improvement and organizational learning, in order to make the organization stand one step ahead of its competitors (Astor et al., 2016; Choo et al., 2015; Schroeder et al., 2008; Tucker et al., 2002; Spear & Bowen, 1999). For instance, Repenning and Sterman (2002) emphasize APS (labeled it as “second-order improvement”) and conclude that sustainable improvement can only be achieved if sufficient stress is laid on reducing the process problems rather than just removing the problem symptoms. In this regard, problem-solvers consider problems as opportunities to learn and move toward improvement. According to the organizational learning perspective, Choo et al. (2015) call this way of approaching the problems as “generative problem-solving” whose main objective is to solve the problems fundamentally that, in turn, generates new skills and understanding.

Figure 2 displays the micro-foundations of APS adoption presented in the form of a causal diagram. Indeed, we present the major factors, polarities of causal relationships and feedback loops of this behavior mode, according to the observations from the case study. However, like in the previous mode, we check if the variable and its relationship with others seem meaningful, i.e. theoretical triangulation, using different theories in the literature of problem-solving.



Group problem-solving with a high collaboration rate tends to become essential for this behavior mode in order to gather valid information regarding the problem structure (i.e. main problem and its root-causes). For instance, Morrison (2015) prescribes working collaboratively with higher employee participation to respond properly to a resource shortage problem and increase productivity, accordingly. In other words, when a problem is viewed from various perspectives provided by different team members with diverse cognitive structures in brainstorming sessions, more *ideas* are generated regarding how to structure the problem (Baer et al., 2013). As a consequence, APS creates and retains *explicit knowledge* (Evans & Stanovich, 2013; Zollo & Winter, 2002) fundamental for *structured corrective actions*. In this regard, problem-solvers view problems as opportunities to learn rather than just liabilities to avoid (Mac Duffie, 1997). This way of responding to the problems is called “*double-loop learning*” where problem-solvers diagnose and alter the identified problem causes (Argyris, 1976). In a similar vein, Choo et al. (2015) empirically conclude that this behavior mode contributes to both internal and external knowledge stocks, necessary to facilitate manufacturing improvements. However, APS becomes effective only with a *delay* as Repenning & Sterman (2002) characterize it as an improvement-based behavior mode whose outcome is not available immediately. Successful adoption of APS is likely to result in positive *changes in operating routines* (Itabashi-Campbell et al., 2011). This reduces the likelihood of *problems recur* and leads to *long-term improvements* eventually (Choo et al., 2015; Repenning & Sterman, 2002; Tucker et al., 2002) as the problems are fundamentally solved.  $R_1$  represents a reinforcing loop in which the more problems fundamentally solved, the more positive changes on operating routines. This eventually causes problem recurrence to decrease and the total number of problems to decline.

## **4. Dynamics of Behavior Modes and Transition between Modes**

In this section, a system dynamics model is employed to analyze how the proposed structures for problem-solving modes behave over time. System dynamics is an appropriate method for this study. The reason is that problem-solving is a complex process and formal simulation models following the system dynamics method can make the complexity transparent, assist to understand the dynamic behavior, and examine the way we think this process should work (Sterman, 2000). Also, system dynamics models, unlike many problem structuring methods that just show the causal relationships in a qualitative manner, provides the opportunity to consider the functional forms, external inputs and initial conditions necessary to simulate the most possible realistic cases (Sterman, 2000).

First, we simulate IPS and APS separately. Doing so deepens the understanding regarding their dynamic behavior and the performance of each. Second, we propose an integrated model which links IPS and APS to gain a more comprehensive picture of problem-solving activities. Simulating the integrated model captures the transition dynamics between two modes, and sheds light on the higher tendency to pursue IPS as a favorable behavior mode.

### **4.1 IPS Adoption**

In order to employ the system dynamics model, the proposed causal diagrams for IPS, discussed in the previous section, are translated into formal simulation models. The results of the simulation are shown<sup>5</sup> for a time horizon of three months (i.e. from time=0 to time=12 weeks) with a time step of 0.25 weeks. More details regarding the way the simulation is run are provided in Appendix A.

---

<sup>5</sup> The system dynamics model used in this study is built in Vensim Simulation Environment for Windows, version 6.4b ([www.vensim.com](http://www.vensim.com)).

Figure 3 demonstrates the simulation result for total number of problems remaining in the system when IPS is adopted. We discuss the performance of this behavior mode as its capacity to solve the problems remaining in the system. Hence, we rely on a premise that the lower number of problems, the better performance.

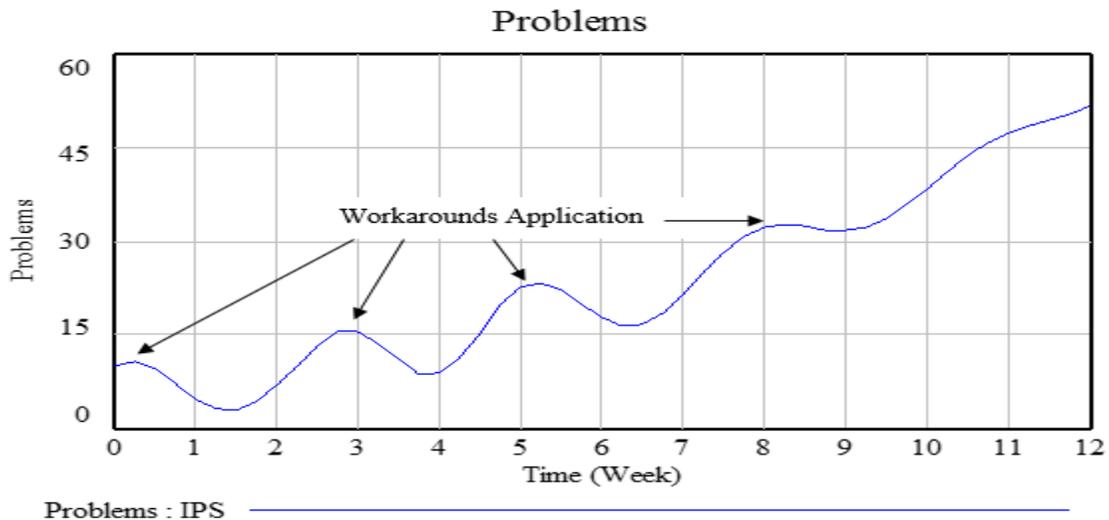


Figure 3: Total Number of Problems Remaining in the System (IPS Adoption)

As an assumption, we consider a closed problem-solving system with 10 initial problems. As depicted, the use of workarounds reduces the total number of problems in the short-term. Indeed, once IPS is adopted and quick fixes and prompt remedies are employed accordingly, total number of problems decreases in a few weeks after the application of a workaround. The reason is that, when there is a high pressure to react, IPS enables problem-solvers to solve the problem temporarily by alleviating the problem symptoms. So, in line with the literature, IPS betters the short-term performance of the firm (Morrison, 2015; Tucker et al., 2002; Reppenning & Sterman, 2002). However, workarounds, although helpful to control the situation and prevent it from getting worse, often fail to address the real problem. The hidden causes of temporarily-solved problems become visible again and problems recur as Figure 3 illustrates an increasing trend of problems in the long-term.

These findings are in line with our insights from the case-study. For example, offering discounts was proposed as a temporarily solution to overcome a problem with customer dissatisfaction due to a delivery delay. Although this could remedy the problem and encourage customers to receive the products at a lower price, the major sources of this dissatisfaction stay uncovered and unsolved. Later, more customer complaints were recorded that might increase the likelihood of losing customers in the future.

## **4.2 APS Adoption**

We also simulate APS by translating the proposed causal diagram of this mode into simulation models following system dynamics methodology. However, we share the same set of assumptions for APS adoption (e.g. initial number of problems in the closed problem-solving system is 10) to allow for an easy comparison between IPS and APS in terms of their effects. Additional information for the simulation of this behavior mode is provided in the Appendix B.

As noted earlier, APS suggests structured actions to successfully cope with the problems. However, APS does not pay off immediately (Repenning & Sterman, 2002). Instead, problem-solvers can reap the full benefits of APS adoption with a delay only. Comprehensive problem formulation takes time (Choo, 2014; Werder, 1999; Mac Duffie, 1997). The reason is that when a problem is initiated, attempts should be made to understand the problem structure. This phase, here called “short-term loss”, occurs when problems are still in the system while problem-solving teams attempt to discover the causes as well as the best solution to take. Once the problem is comprehensively formulated and the root-causes are identified, problem-solvers take the structured actions to fundamentally solve the problem. This phase can be called “long-term gain” (Longenecker et al., 1994). The trend of overshoot and collapse is depicted in Figure 4, where the total number of problems gradually increases from  $t=0$  to  $t=3$  and then starts decreasing until the

end of the simulation. However, this can only be achieved when the organization is willing to accept short-term losses for potential long-term gains.

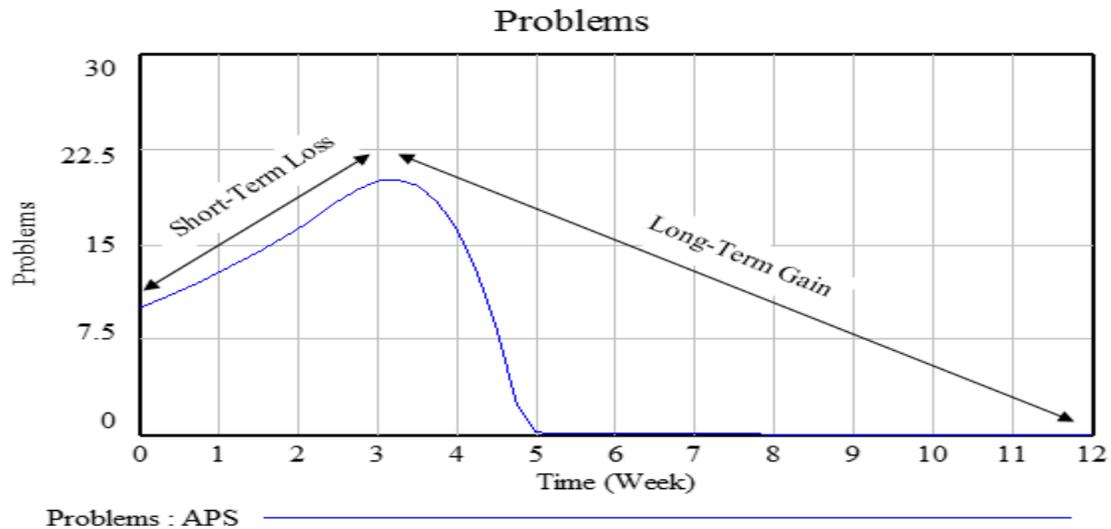


Figure 4: Total Number of Problems Remaining in the System (APS Adoption)

### 4.3 An Integrated Model: Scenarios to Investigate IPS Dominance

We also propose an integrated problem-solving model by linking IPS and APS for three main reasons. First, to have a more comprehensive picture of problem-solving activities and to allow for a better comparison between IPS and APS. Second, to underline the second aim of the study regarding understanding the major reasons for “*IPS dominance*”. Connecting these behaviors seems necessary to discover what factors or conditions favor IPS and hinder APS while dealing with complex problems. Third, to investigate different situations and consequently to identify effective problem-solving strategies and relevant policies (i.e. to see under what conditions IPS and APS succeed).

To have a better comparison between IPS and APS and to understand the phenomenon of “*IPS dominance*”, we define two scenario variables. The first one, P1, is time pressure to solve the problems immediately that results in quick reactions for the problems (Repenning & Sterman,

2002; Tucker et al., 2002). The second one, P2, is managerial intervention to allocate resources and support collaboration to encourage APS and fundamental solutions, accordingly (Morrison, 2015). As a result, four different scenarios are investigated where P1 and P2 could be either high or low. We briefly introduce each scenario as follows:

- I. *High time pressure and low managerial intervention*: This is a scenario with high urgency to solve the problems quickly. However, low attention is placed by senior executives to encourage collaboration for APS.
- II. *High time pressure and high managerial intervention*: This case represents a situation where, although there is high problem urgency, top managers believe in APS effectiveness and consequently sufficient attention is given for team problem-solving.
- III. *Low time pressure and low managerial intervention*: In this situation, problem-solvers are not required to react quickly to the problems. Indeed, they have an adequate time to comprehensively formulate the problem, but APS is not emphasized by the top managers.
- IV. *Low time pressure and high managerial intervention*: According to this scenario, there is no high pressure to solve the problems immediately, but senior executives demonstrate a high priority for collaboration and APS, consequently.

For simulating this model, the same set of assumptions, made previously for IPAS and APS, are considered. Simulation results of defined scenarios (Figure 5) reveal that IPS always outperforms APS in the short-term, when there is high problem urgency. However, in the long run, APS has a better performance in terms of the total number of problems remaining in the system. The reason is that APS becomes effective only with a delay.

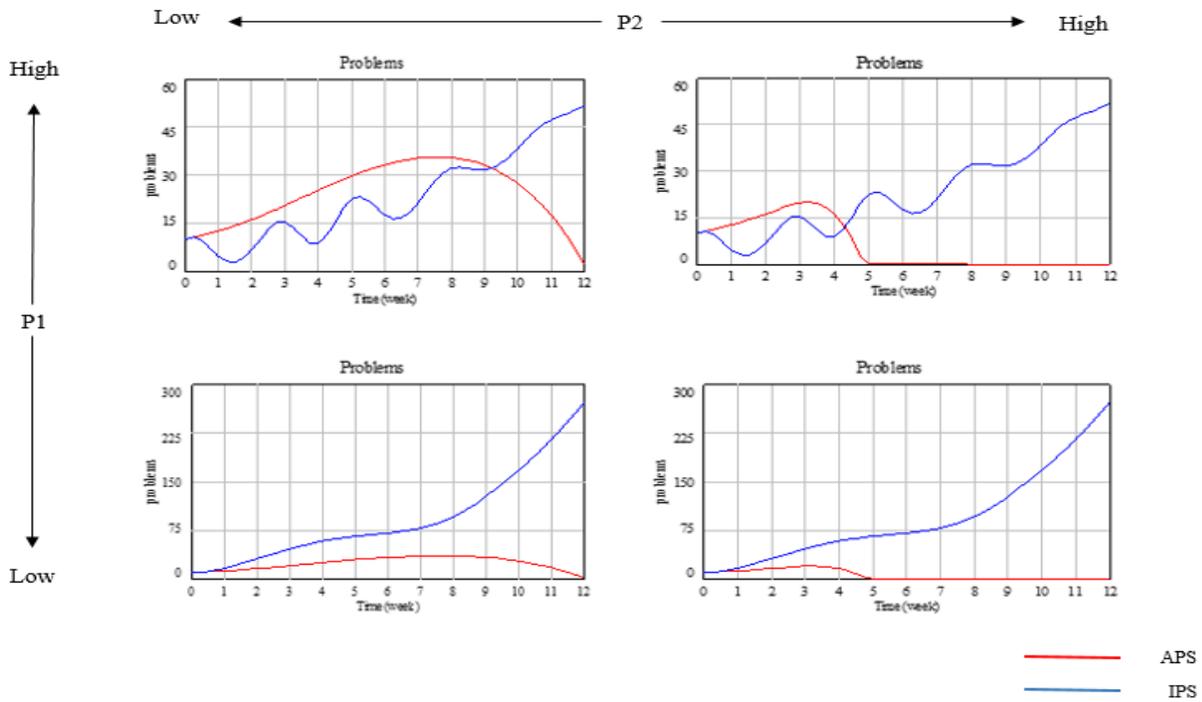


Figure 5: IPS vs. APS in Four Scenarios

The first and second scenarios with high time pressure, represent the most realistic cases as in today’s competitive environment, there is always a necessity to respond quickly. This claim is also supported in the studied company where most of the problems are required to be coped with immediately. The summary of results is presented in Table 3.

Table 3: Summary of Results of Scenarios Defined

Scenario Variables	P2 (Managerial Intervention)	
	Low Managerial Intervention	High Managerial Intervention
High Time Pressure	IPS in Short-Term & APS in Long-Term	IPS in Short-Term & APS in Long-Term
Low Time Pressure	APS	APS

Consistent with two defined scenario variables, we discover two major reasons for “*IPS dominance*”. The first one is introduced as high problem urgency. As a matter of fact, problem-solvers need to quickly react to the problem when time pressure is extremely high. The reason is that problem-solvers are required to spend a long time on APS adoption and when problem urgency is high, they simply do not have that time to engage in comprehensive problem formulation activities. As a consequence, IPS is more likely to be adopted for problem-solving. The second reason is managers with a short-term horizon. These managers care most about immediate success and as a consequence IPS tends to become a dominant behavior mode because IPS adoption improves the short-term performance of the firm as problems are temporarily solved. Managers with short-term horizon might create and spread the fire-fighting syndrome along the organization. The way they force problem-solvers to deal with the problems (e.g. “Don’t bring me the problem, bring me the solution”, Frei-2007, p. 3) might drive them to act as the satisficers rather than analytical problem-solvers.

Along with identified reasons for “*IPS dominance*”, we claim that insufficient organizational factors might lead IPS to take precedence over APS. The reason is that, problem-solvers can gain the most out of APS adoption when a set of organizational factors is established in the firm. In other words, APS ameliorates the long-term performance of the firm, but this positive relationship is contingent, rather than deterministic, at the presence of some factors. These factors, also highlighted in APS causal diagram, are introduced as organizational antecedents (i.e. managerial awareness, collaborative culture, and organizational resource access) for a successful APS adoption. Inadequate attention to establish and maintain these organizational antecedents hinders APS, creates incentives for jumping to a solution, and eventually increases the likelihood for “*IPS dominance*”. These factors are also well-understood in the literature. For example, Mac Duffie

(1997), concludes that significant cost concerned with APS adoption could be a barrier of this behavior mode and an important driver of IPS adoption. There is also a considerable consensus in the problem-solving literature regarding the effectiveness of team-work for APS adoption (Choo, 2014; Baer et al., 2013). As an example, Morrison (2015) prescribes team-work with high employee participation as an effective way to respond properly to the resource shortage problem. However, these organizational antecedents could be maintained under the managerial awareness and a proper leadership (e.g. Marksberry et al., 2010; Bohn, 2000; Longenecker et al., 1994; Beer et al., 1990).

All in all, based on these three reasons, the analytical reasoning of the problem-solvers is narrowed, and their problem-solving capability is limited to jumping to a solution based on their pre-existing knowledge (i.e. IPS adoption). The main reasons of “IPS dominance” are shown in Table 4.

Table 4: “IPS Dominance” Reasons

Variables	Definition	Reasons for IPS Dominance
Scenario Variables	P1	Time Pressure
	P2	Managerial Intervention
Organizational Variables	APS Organizational Antecedents	High Problem Urgency Managers with Short-Term Horizon Insufficient Organizational Antecedents for APS (i.e. Organizational Resources, Collaborative Culture, and Managerial Awareness)

However, it is also possible to interpret the results from another perspective. IPS should be preferred when problem urgency is extremely high (e.g. in a crisis). In other words, where the

sense of urgency overtakes the need for problem formulation comprehensiveness, IPS can be adopted to control the situation from getting worse and keep operations running although only in a suboptimal way.

#### 4.4 Simultaneous Adoption of IPS and APS

In all previous cases, we have assumed that problems-solvers adopt only either IPS or APS. However, the proposed integrated model provides the opportunity to simulate a case in which top managers consider both behavior modes, simultaneously. In this setting, neither IPS nor APS are not totally ignored. Instead, problem-solvers might adopt IPS to keep the production running and APS, simultaneously, to completely solve the problems. To do so, we test various resource allocation mechanisms by simulating the integrated model with different portions of resources allocated for IPS and APS. Simulation results are presented in Figure 6, where, for instance, the red line represents the situation in which a higher percentage of resources (in this case 70 %) is assigned for IPS to take immediate corrective actions. In this case, IPS carries more weight from a top manager’s point of view either because of problem urgency or their short-term horizon.

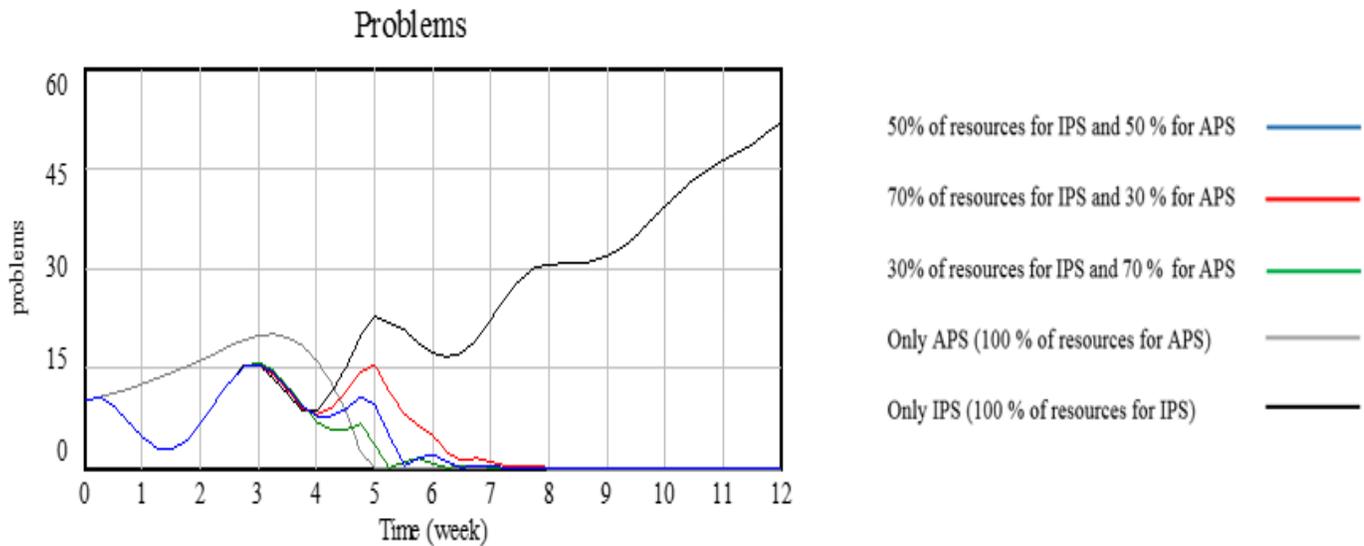


Figure 6: IPS and APS with Different Human Resource Portions

Simulation results suggest that the best problem-solving strategy to take could be a combination of IPS and APS, but with a priority for APS. As depicted in Figure 6, when both behavior modes are emphasized and subsequently the resources are assigned for IPS and APS simultaneously (blue, red, and green lines), the total number of problems in the system is less than the situations where just IPS or APS solely (black and grey lines) is adopted in both short-term (before T=4) and long-term (after T=4). The green line, the situation in which just 30 % of employees are engaged in IPS to control the situation and 70 % of resources are allocated to work in a team for APS, represents, in our example, the best strategy considering the total number of problems remaining in the system in both short-term and long-terms.

## 5. Discussion

The focus of this study is to compare two distinct problem-solving behavior modes, adopting a cognitive perspective. The first behavior mode, namely IPS, is solution-centric whereby problem-solvers employ quick fixes to remediate the problem by just removing its symptoms. The second one, introduced as APS, is a problem-centric behavior mode where more attention is placed on the problem and its root-causes rather than the solution. First, we thoroughly study these behavior modes and establish the causal micro-foundations of each. To do that, motivated by field work in a manufacturing plant, we propose the structure of each behavior mode by unpacking them. We illustrate how IPS and APS could be adopted for operational problems and explicate the way they can contribute to the business excellence. From an organizational learning perspective, we realize how implicit and explicit knowledge could affect the performance of each behavior mode (*IPS: implicit knowledge based on existing hypotheses and personal experiences → workarounds → problems temporarily solved → short-term improvement / APS: explicit knowledge based on valid*

*information → structured corrective actions → problems fundamentally solved → long-term improvements).*

Then, along with observational data, literature supports IPS as the favored behavior mode for confronting problems, even though the superior effectiveness of APS for problem-solving is asserted in the literature (Baer et al., 2013; Repenning & Sterman, 2002; Tucker et al., 2002; Tucker & Edmondson, 2003). Therefore, this study also attempts to explore the major reasons that limit APS and in turn lead to a phenomenon called “*IPS dominance*”. Using the system dynamics modeling and with the help of simulation analysis, we identify three paramount factors that cause IPS to take precedence over APS in the context of operational problem-solving. The first one is problem urgency emerging from an extremely high time pressure to react quickly to the problems. In other words, problem-solvers are more likely to adopt IPS when the sense of urgency overtakes problem formulation comprehensiveness. Bohn (2000) characterizes IPS adoption as a collection of symptoms and points out that the managers could be the victims of fire-fighting syndrome when “ongoing problem-solving efforts and long-range activities, such as developing new processes, are repeatedly interrupted and deferred because fires must be extinguished” (p; 84). This pressure, either an internal pressure from top managers to solve the problems as soon as possible (Repenning & Sterman, 2002; Frei, 2007) or an external one due to harsh environmental dynamism (Staats et al., 2011; Itabashi-Campbell et al., 2011; Longenecker et al., 1994), makes problem-solvers act as quick satisfiers and jump to solutions without enough consideration of the current situation. The second one is recognized as the managers with a short-term horizon who care most about immediate success rather than sustainable development of the firm. In this case, top managers focus massively on prompt remedies while less attention is placed on long-term consequences of decisions. In a similar vein, Repenning and Sterman (2002) discuss IPS adoption and argue that

immediate and salient outcomes of IPS adoption makes this behavior mode favorable. However, the tendency to the quick remedies is an instinctive reaction and seems common due to the cognitive limitation of problem-solvers. In other words, IPS adoption comes naturally and controlling this basic cognitive processing requires deliberate intervention for information processing of individuals (Astor et al., 2016).

We also highlight organizational antecedents for the successful APS adoption. In this regard, we emphasize managerial awareness, collaborative culture, and organizational resource access necessary to fully take advantages of APS adoption. Literature on problem-solving devotes attention on the substantial role played by senior executives on the comprehensive problem formulation activities, i.e. APS adoption. To allocate resources (Morrison, 2015), provide necessary training (Marksberry et al., 2010; Repenning & Sterman, 2002; Garvin, 1993), emphasize team-work and encourage front-line employees to participate in APS by making incentives (Baer et al., 2013; Garvin, 1993), create commitment (Powel, 1995), and trigger the culture of continuous improvement, change and learning (Bohn, 2000; Longenecker et al., 1994; Beer et al., 1990) are recognized as the most considerable responsibilities a senior executive should carry to implement the successful APS adoption. Hence, we conclude that the lack of attention to establish and maintain these antecedents emerges as the third reason that leads to a higher tendency to pursue IPS for the problem resolution.

Finally, we illustrate that a combination of IPS and APS could be the best problem-solving strategy to deal with problems. In this regard, IPS is emphasized in order to control the problematic situation and prevent it from getting worse. However, problems are temporarily solved only and production is kept running in a sub-optimal way. Thus, simultaneously, APS adoption should be encouraged to solve the problems fundamentally, contribute to strategic capabilities such as

organizational learning and continuous improvement, and eventually ameliorate the long-term firm performance. We demonstrate that IPS should not be always ignored especially when fighting a fire is extremely required (Astor et al., 2016).

In the next section, we highlight the implications of our findings.

## **6. Conclusion**

This study is not about presenting novel tools and techniques for problem-solving. Instead, we analyze two potential solutions to overcoming operational problems, according to the cognitive perspective. This study contributes to a body of literature in operations management where a rational-comprehensive approach is strongly suggested to cope with problems. Although there are various approaches and well-established strategies to structure APS, such as lean manufacturing or Six Sigma DMAIC, in operations management literature, we open the black box of this behavior mode and demonstrate how APS can contribute to the business excellence.

In this study, we also emphasize the organizational antecedents for a successful APS adoption. We conclude that, managerial awareness, team-work and collaborative culture, and having access for organizational resources are vital for this behavior mode. We believe that this can shed some interesting lights regarding why many firms fail to get the most out of APS adoption or struggle to achieve its sustainable outcomes over time.

Although this study focuses on operational problems, the main findings could be cautiously generalized at strategic level of the firms where upper managers are required to deal with ill-structured problems (i.e. strategic decisions). Indeed, APS adoption is also stressed in the strategic management literature where rationality or comprehensiveness is strongly recommended when making strategic decisions.

This study provides relevant information for managers and practitioners to realize the circumstances by which they are able to gain the most out of each behavior mode. We propose a guideline for managers to set different problem-solving strategies and relevant policies in different situations, for instance, when the problem urgency is extremely high.

Like any other study, this research is not without limitations. First, we do not discuss the importance and the complexity of the problems. We assume all the problems in the same level of complexity and our focus is to illustrate how the two behavior modes perform. However, different problems in terms of complexity and uncertainty might affect the way problem-solvers approach and respond to them. Second, we compare the performance of IPS and APS in terms of effectiveness (accomplishing the goal of solving the problem). However, investigating these behavior modes in terms of efficiency (functioning in terms of time, energy and efforts) is still unexplored and could be recognized as a potential question to be discovered for further studies.

## 7. References

- Argyris, C. (1976). Single-loop and double-Loop models in research on decision making. *Administrative Science Quarterly*, 21(3), 363–375.
- Astor, T., Morales, M., & Repenning, N. (2016). What problem are you trying to solve: An Introduction to structured problem solving. *MIT Sloan School of Management, Working Paper*.
- Baer, M., Dirks, K., T., & Nickerson, J., A. (2013). Microfoundations of strategic problem formulation. *Strategic Management Journal*, 34, 197–214.
- Bartee, E. M. (1973). A holistic view of problem solving. *Management Science*, 20(4-Part-I), 439–448.
- Beer, M., Eisenstat, R., & Spector, B. (1990). Why change programs don't produce change. *Harvard Business Review*, 68(6), 158-166.
- Bohn, R. (2000). Stop fighting fires. *Harvard Business Review*, 83–91.
- Brooks, I. (1994). Managerial Problem Solving: A Cultural Perspective. *Management Decision*, 32(7), 53–59.
- Büyükdamgaci, G. (2003). Process of organizational problem definition: How to evaluate and how to improve. *Omega*, 31(4), 327–338.
- Choo, A. S. (2014). Defining problems fast and slow: The U-shaped effect of problem definition time on

- project duration. *Production and Operations Management*, 23(8), 1462–1479.
- Choo, A. S., Nag, R., & Xia, Y. (2015). The role of executive problem solving in knowledge accumulation and manufacturing improvements. *Journal of Operations Management*, 36, 63–74.
- De Mast, J. (2013). Diagnostic quality problem solving : A conceptual framework and six strategies. *Quality Management Journal*, 20(4), 21–36.
- De Mast, J., & Lokkerbol, J. (2012). An analysis of the Six Sigma DMAIC method from the perspective of problem solving. *International Journal of Production Economics*, 139(2), 604–614.
- Donaldson, R., M. (1972). Systematic problem solving. *Management Review-Condensed from Journal of Systems Management*, 48–50.
- Easton, G. S., & Rosenzweig, E. D. (2012). The role of experience in six sigma project success: An empirical analysis of improvement projects. *Journal of Operations Management*, 30, 481–493.
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532–550.
- Evans, J. S. B. T., & Stanovich, K. E. (2013). Dual-process theories of higher cognition: Advancing the debate. *Perspectives on Psychological Science*, 8(3), 223–241.
- Frei, F. (2007). Conventional wisdom “ Don’t bring me problems-bring me solutions!” *Harvard Business Review*, 3.
- Garvin, D., A. (1993). Building a learning organization. *Harvard Business Review*, 78–91.
- Gibbert, M., Ruigrok, W., & Wicki, B. (2008). What passes as a rigorous case study? *Strategic Management Journal*, 29, 1465–1478.
- Gray, P. H. (2001). A problem-solving perspective on knowledge management practices. *Decision Support Systems*, 31(1), 87–102.
- Jick, T. D. (1979). Mixing Qualitative and Quantitative Methods : Triangulation in Action. *Administrative Science Quarterly*, 24(4), 602–611.
- Koskinen, K. U. (2012). Problem absorption as an organizational learning mechanism in project-based companies: Process thinking perspective. *International Journal of Project Management*, 30(3), 308–316.
- Longenecker, Scazzero, & Stansfield. (1994). Quality improvement through team goal setting , feedback , and problem solving. *International Journal of Quality & Reliability Management*, 11(4), 45–52.
- Lyles, M. (1981). Formulating strategic problems: empirical analysis and model development. *Strategic Management Journal*, 2, 61–75.
- Lyles, M. A. (2014). Organizational learning , knowledge creation , problem formulation and innovation in messy problems. *European Management Journal*, 32(1), 132–136.
- Lyles, M. A., & Mitroff, I. (1980). Organizational problem formulation : An empirical study. *Administrative Science Quarterly*, 25(1), 102–119.
- Lyles, M., A., & Thomas, H. (1988). Strategic problem formulation: Biases and assumptions embedded in alternative decision-making models. *Journal of Management Studies*, 25(2), 131–145.
- Mac Duffie, J. . (1997). The road to “rootcause”: shop-floor problem solving at three auto assembly plants. *Management Science*, 43(4), 479–502.

- Marksberry, P., Badurdeen, F., Gregory, B., & Kreaflle, K. (2010). Management directed kaizen: Toyota's Jishuken process for management development. *Journal of Manufacturing Technology Management*, 21(6), 670–686.
- Marksberry, P., Bustle, J., & Clevinger, J. (2011). Problem solving for managers: a mathematical investigation of Toyota's 8-step process. *Journal of Manufacturing Technology Management*, 22(7), 837–852.
- Mitroff, I. I., & Featherirjgham, T. R. (1974). On systematic problem solving and the error of the third kind. *Behavioral Science*, 19, 383–393.
- Morrison, B. (2015). The problem with workarounds is that they work: The persistence of resource shortages. *Journal of Operations Management*, 39-40, 79–91.
- Powel, T. C. (1995). Total quality management as competitive advantage: A review and empirical study. *Strategic Management Journal*, 16, 15-37.
- Priem, R. L., Rasheed, A., M., A., & Kotulic, A., G. (1995). Rationality in strategic decision processes, environmental dynamism and firm performance. *Journal of Management*, 21(5), 913–929.
- Repenning, N. P., & Sterman, J. D. (2002). Capability traps and self-confirming attribution errors in the dynamics of process improvement. *Administrative Science Quarterly*, 47(2), 265–295.
- Schroeder, R. G., Linderman, K., Liedtke, C., & Choo, A. S. (2008). Six Sigma: Definition and underlying theory. *Journal of Operations Management*, 26(4), 536–554.
- Schwenk, C. R. (1995). Strategic decision making. *Journal of Management*, 21(3), 471–493.
- Smith, G. F. (1988). Towards a heuristic theory of problem structuring. *Management Science*, 34(12), 1489–1507.
- Smith, G. F. (1989). Defining managerial problems: A framework for prescriptive theorizing. *Management Science*, 35(8), 963–981.
- Spear, S., & Bowen, H., K. (1999). Decoding the DNA of the Toyota production system. *Harvard Business Review*, 77(5), 96–106.
- Sterman, J. D. (2000). *Business Dynamics: Systems Thinking and Modeling for a Complex World*. McGraw-Hill, Irwin, Pa, USA.
- Stuart, I., McCutcheon, D., Handfield, R., McLachlin, R., & Samson, D. (2002). Effective case research in operations management: A process perspective. *Journal of Operations Management*, 20(5), 419–433.
- Tucker, A. L., & Edmondson, A. C. (2003). Why hospitals don't learn from failures: *California Management Review*, 45(1), 55–72.
- Tucker, A. L., Edmondson, A. C., & Spear, S. (2002). When problem solving prevents organizational learning. *Journal of Organizational Change Management*, 15(2), 122–137.
- Tyre, M. J. (1995). Systematic versus Intuitive Problem Solving on the Shop Floor : Does it Matter ? *Massachusetts Institute of Technology Sloan School of Management Working Paper*, (3716).
- Volkema, R. J. (1986). Problem formulation as a purposive activity. *Strategic Management Journal*, 7, 267–279.
- Volkema, R. J., & Gorman, R. H. (1998). The influence of cognitive-based group composition on

- decision-making process and outcome. *Journal of Management Studies*, 35(1), 105–121.
- Werder, A. V. (1999). Argumentation rationality of management decisions. *Organization Science*, 10(5), 672–690.
- Yin, R. K. (1981). The Case Study Crisis : Some Answers. *Administrative Science Quarterly*, 26(1), 58–65.
- Zollo, M., & Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, 13(3), 339–351.

## Appendix A

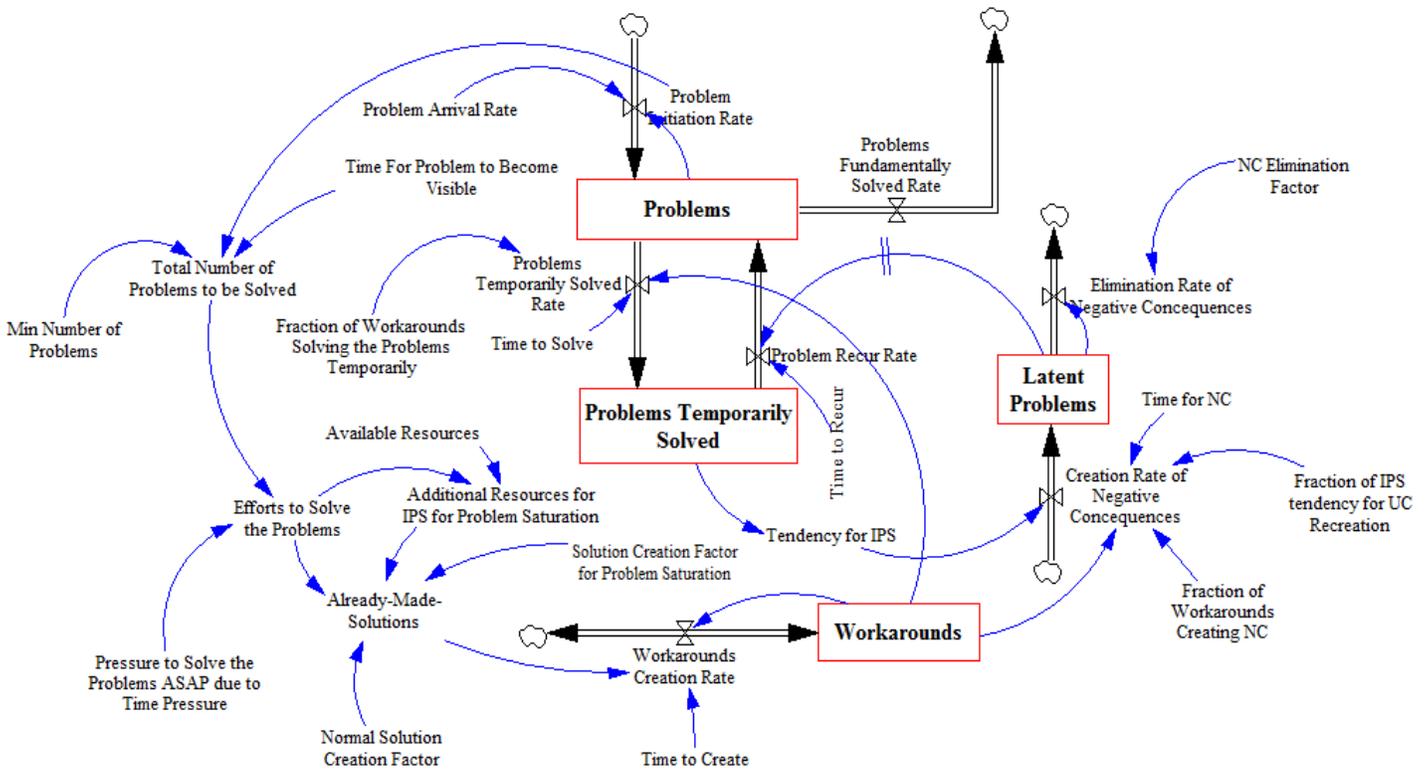


Figure 7: Stock and Flow Diagram for IPS

### Equations Used for IPS Adoption Simulation:

In order to simulate the behavior modes, the proposed causal diagrams have to be converted into formal system dynamic method using stock and flow diagram. According to the system dynamic theory, stocks are accumulation and altered by inflows and outflows. Stocks creates delays by accumulating the difference between the inflow and its outflows (Sterman, 2000). This part shows the way the most considerable stocks, inflows, and outflows are calculated.

For the stock “Problems”, two inflow rates and two outflow rates are defined. So, the formula is as bellow:

(1) Problems = INTG (Problem Initiation Rate + Problem Recur Rate - Problems Fundamentally Solved Rate - Problems Temporarily Rate); In other words, the total number of problems remaining in the system could be calculated as the difference between the problems that enter to the system (the sum of problem initiation rate and problem recur rate) and the problems that are either temporarily or fundamentally solved (the sum of problems fundamentally solved and the problems temporarily solved).

Units: # Problems; the unit is the number of problems in the system.

Initial Value = 10; As an assumption, the initial number of problems in the system is 10.

(2) Problems Temporarily Solved= INTG (Problems Temporarily Solved Rate – Problem Recur Rate)

Units: # Problems

Initial Value = 10

(3) Latent Problems = INTG (Creation Rate of Negative Consequences – Elimination Rate of Negative Consequences)

Units: # Problems

Initial Value = 10

(4) Workarounds= INTG (Workarounds Creation Rate)

Units: # Solutions

Initial Value= 10

(5) Creation Rate of Negative Consequences= (Workarounds \* Fraction of Workarounds Creating Negative Consequences)/ Time for Negative Consequences + (Tendency for IPS \* Fraction of IPS Tendency for Negative Consequences Recreation)/ Time for Negative Consequences); When a problem is temporarily solved, it brings gratification and self-confidence for the problem-solver that creates a higher tendency for IPS adoption for further problems.

Units: Problems/ Week

(6) Additional Resources for IPS in Problem Saturation= IF THEN ELSE (Efforts to Solve the Problems > 30, Available Resources, 0); Available resources are assigned just in problem saturation phase, when total number of problems exceeds a certain level (30 in our example). Otherwise, in normal situation, top-managers stay with the current employees to employ already-made solutions.

Units: People

Available Resources = 10

(7) Pressure to Solve the Problems as soon as possible due to Time Pressure= 10; IPS is characterized by an urgency to solve the problems immediately. This occurs due to time pressure. From a scale of 1 to 10, we consider 10 as the maximum value for this pressure.

Units: Dmn/ Problems

## Appendix B

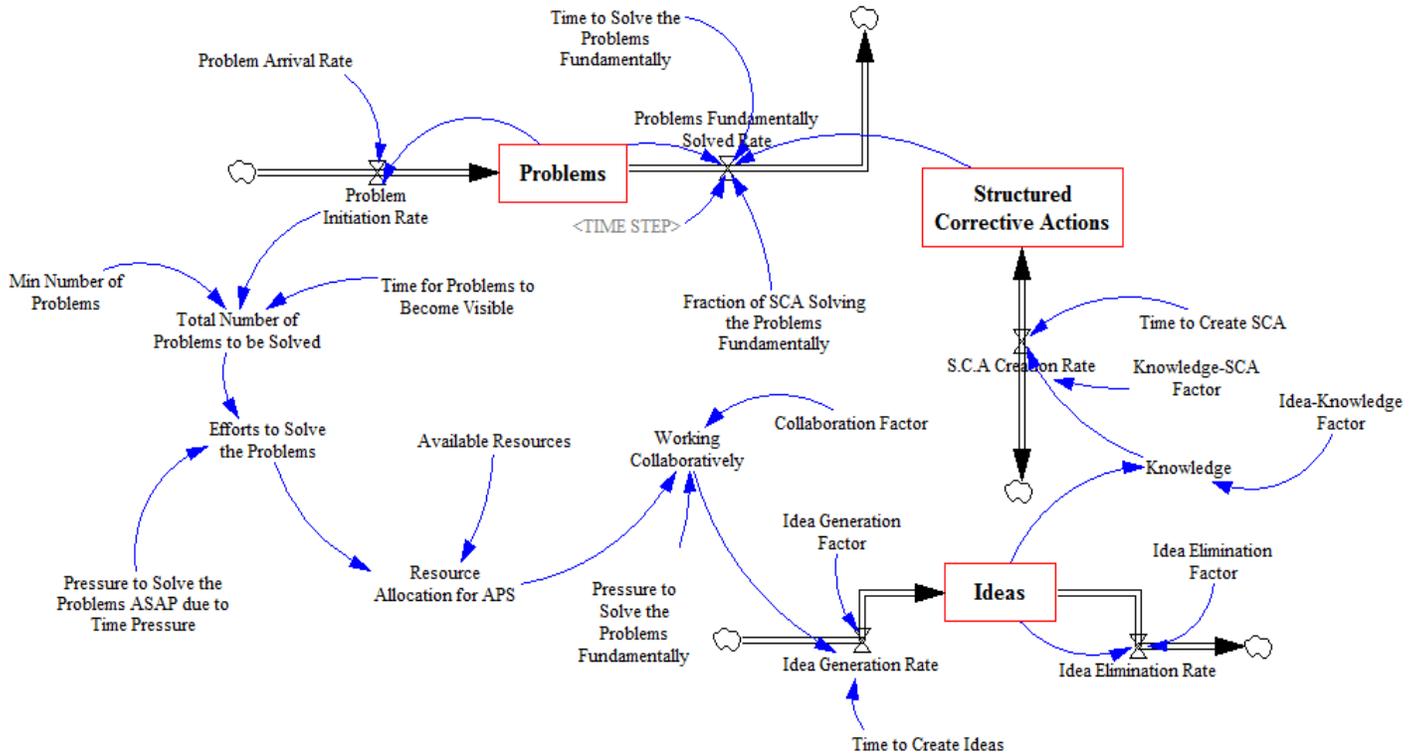


Figure 8: Stock and Flow Diagram for APS

### Equations Used for APS adoption Simulation:

(1)  $\text{Problems} = \text{INTG} (\text{Problem Initiation Rate} - \text{Problems Fundamentally Solved Rate})$

Units: Problems

Initial Value = 10

(2)  $\text{Ideas} = \text{INTG} (\text{Idea Generation Rate} - \text{Idea Elimination Rate})$

Units: Solutions

Initial Value = 0

(3)  $\text{structured Corrective Actions} = \text{INTG} (\text{Structured Corrective Action Creation Rate})$

Units: Solutions

Initial Value = 0

(4) Resource Allocation for APS = IF THEN ELSE (Efforts to Solve the Problems > 0, Available Resources, 0); In APS adoption, unlike IPS, human resources are assigned for structured actions once a problem is initiated.

Units: People

(5) Working Collaboratively = Resource Allocation for APS \* Collaboration Factor \* Pressure to Solve the Problems Fundamentally; In APS adoption, unlike IPS, top managers encourage team-based problem-solving by stressing on collaboration.

Units: Dmnl

(6) Pressure to Solve the Problems Fundamentally = 10; APS adoption is characterized by top managers awareness and attention to solve the problem fundamentally using structured corrective actions rather than forcing the employees to employ short-term remedies for IPS. So, from a scale of 1 to 10, we consider 10 as the maximum value for this pressure.

Units: Dmnl

(7) Knowledge = Ideas \* (Idea-Knowledge Factor)

Units: Dmnl

(8) Idea-Knowledge Factor = 0.5, This is constant and we assume that half of the total ideas generated regarding the problem structure (i.e. the precise problem, and its potential causes) by the team can be converted to rich and valuable knowledge as the foundation for structured corrective actions.

Units: Dmnl/ Solutions

(9) Problems Fundamentally Solved Rate = (Structured Corrective Actions \* Fraction OF Structured Corrective Actions Solving the Problems Fundamentally)/ Time to solve the Problems Fundamentally; In APS, no problems are temporarily solved. Instead we assume that all the problems (100 %) are fundamentally solved by the help of employed structured actions.

Units: Problems/ Week

(10) Fraction of Structured Corrective Actions Solving the Problems Fundamentally = 1



# CEO's Analytical Problem-Solving and Psychological Determinants of Success: Evidence from Iran

**Abstract-** Drawn from upper-echelon and positivism theories, we empirically examine whether, or not, CEOs' positive psychological traits, in particular hope, optimism, and resiliency, could ameliorate their analytical problem-solving (APS) behavior and in turn organizational performance. Results, using a structural equation modeling and based on a sample of 373 Iranians (201 CEOs and 172 followers), reveal that hope and resiliency separately have positive effects on APS of the CEO. We also demonstrate that three positive traits jointly, i.e. when hope, optimism, and resiliency are combined into a core construct of positive psychological traits (PPT), positively affect APS. However, PPT as a core construct is more strongly correlated to APS than hope, resilience and optimism taken in isolation. This indicates that APS is more likely to be adopted as a favorable problem-solving behavior when CEOs are, at the same time, hopeful, optimistic, and resilient than when they present only one or two of these traits. Additionally, we find support for the positive impacts of APS on organizational performance. Implications for theory and practice are also discussed.

**Keywords-** Upper-Echelons, CEO, Positive Psychological Traits, Analytical Problem-Solving, Organizational Performance, Structural Equation Modeling

## 1. Introduction

There is a long history of debate on substantial role played by senior managers in firm performance. Based on theory of upper-echelon, originally proposed by Hambrick & Mason (1984), characteristics of top executives, in particular CEOs, do matter for organizational success. This claim is further supported by numerous studies centered to answer an important question: How much do CEOs matter? Results reveal that CEO effects, compared to industry and firm effects, explain a considerably high variation of total firm performance (e.g. Quigley & Graffin,

2017; Quigley & Hambrick, 2015; Mackey, 2008). The reason is that the way an organization performs and carries out its functions could be substantially explained by the profile of its upper managers, in particular how the CEO thinks, behaves and leads the organization toward success or failure (Hambrick, 2007; Chaganti & Sambharya, 1987). Therefore, CEO's characteristics are related to firm-level performance as consequence of their leadership behavior (Mackey, 2008; Collins, 2001) as well as their crucial role for deciding the organization's course of action (Tichy & Cohen, 1997; Hart & Quinn, 1993). However, relying just on demographic characteristics of CEOs (e.g. age, tenure and education) cannot fully represent the upper-echelon theory and fail to provide a comprehensive picture regarding the importance of senior executives (Waldman et al., 2001). Years after the original 1984 AMR article for the upper-echelon theory (Hambrick & Mason, 1984), Hambrick (2007) provides an update for this theory and emphasizes psychological attributes, largely unexplored though, as the main driver of executive behavior also influential for managerial decisions. In a similar vein, Collins (2001) in his book "*good to great*" highlights leadership style as the core determinant of high performance achievement and highlights personality traits (i.e. humility) in a conjunction with intense professional will of a CEO as two slides of a "level 5 leader" to move from being good to great and guarantee sustainable success, accordingly. The reason is that, personality traits, fundamental for workplace behavior (Barrick et al., 2013; Seligman, 2002), shape CEO's leadership, influence the strategic behavior and managerial actions, and eventually affect business excellence. Although many studies, in this stream, emphasize top management team (TMT) and its effects of firm-level performance (e.g. Peterson et al., 2003; Finkelstein & Hambrick, 1990), we focus just on CEOs as the influential members of TMTs to affect others in the team for the managerial decisions (e.g. Mackey, 2008).

In this study, we claim that the psychology of CEOs to make sense of things affects their managerial decisions thus including the way problems are dealt with at strategic level of the organization. In other words, we consider managerial problem-solving (e.g. strategic decision making) as a reflection of the leadership capability of CEOs (Mannor et al., 2016; Nadkarni & Herrmann, 2010; Hambrick, 2007) that arguably affects firm-level performance. However, there is a considerable consensus among researchers that not every problem-solving behavior brings success for the organizations (Baer et al., 2013; Nooraie, 2008; Reppenning & Sterman, 2002; Schwenk, 1995). Literature on problem-solving and strategic decision making makes a clear distinction between two behavioral attitudes individuals can perform to approach and respond to a problem. Based on dual-process theory that adopts a cognitive perspective for information processing (Evans & Stanovich, 2013), one attitude is intuitive problem-solving (IPS hereafter) which means to jump to a solution with minimal cognitive efforts, whereby individuals employ heuristic and shortcuts to overcome the problematic situation. The other attitude, conversely, is analytical problem-solving (APS hereafter) defined as the deliberate and reflective efforts to discover the most appropriate solution by the use of a set of structured actions. In fact, APS encompasses different steps of problem formulation (i.e. problem definition and problem analysis) and solution design (i.e. solution generation, solution evaluation, and decisions for the best applicable solution among the proposed alternatives).

Given these two behavioral attitudes, APS is recognized as a superior one in the literature as it leads to the higher quality decisions, contributes to strategic capabilities in particular organizational learning and continuous improvement opportunities and ameliorates the firm-level performance (e.g. Baer et al., 2013; Hough & White, 2003; Argyris, 1976).

Linking CEO's psychological attributes to the upper-echelon theory sheds light on an important dimension of this theory which is largely unexplored and opens up an interesting question regarding the effects of executive's emotions and thoughts on shaping their perceptions toward solving the problems at strategic level. However, most of the behavioral studies in management focus on human dysfunctions and thus seek the ways to successfully cope with the failures at the workplace (Peterson & Luthans, 2003; Luthans et al., 2005; Luthans, 2002). This study, instead, is an attempt to move away from this negative perspective and place more attention on the *positivism* by explicating how individual's positive traits can contribute to the firm-level performance. Among different psychological traits such as big 5 personality traits, i.e. openness, conscientiousness, extraversion, agreeableness, and neuroticism (Nadkarni & Herrmann, 2010), charisma (Waldman et al., 2001), and narcissism (Tang et al., 2017), to name a few, the focus of this study is on traditional theories of hope (Snyder et al., 1991), optimism (Scheier & Carver, 1985) and resiliency (Block & Kremen, 1996) as they well-present the positivism. We discuss the psychological antecedents of APS behavior and study whether, or not, the way individuals perceive things having a positive attitude could be influential for their behaviors at the workplace, their perception toward problems and, in turn, necessary for the organizational success.

We test our theoretical framework using a structural equation modeling (SEM) on cross-sectional data obtained from a sample of 373 observations (201 CEOs and 172 followers) in Iran. We believe that the choice of Iran as the research setting is of particular importance. Iran is located in the Middle-East recognized as a source of many conflicts. The political conditions of Iran, accompanied by the heavy sanctions, negatively affect the economy of the country (e.g. high inflation rate, currency depreciation) impose a considerably high pressure to the organizations and make the external environment even harsher, riskier, and more unpredictable compared to other

developing countries. Therefore, the country is subject to an external pressure that can influence the way organizations decide and make their strategic choices (Hough & White, 2003; Badri et al., 2000; Goll & Rasheed, 1997). Many studies in strategic decision making discuss that high-velocity environments raise the necessity of APS as a behavior mode for the advanced performance (e.g. Child & Rodrigues, 2011; Mueller et al., 2007; Badri et al., 2000). So, it is compelling to study Iran to see if the organizations as problem-solving entities adopt APS to gain rich information and accordingly mitigate the external or environmental uncertainty or the problem-solving behavior conversely is limited to a quick response, i.e. IPS adoption, to the hostile environment (Hough & White, 2003; Fredrickson & Iaquinto, 1989). Additionally, this research setting might suggest whether, or not, in this environment, APS can guarantee organizational success. All in all, we develop this study in a context with high environmental uncertainty as an accurate situation and an ideal setting to analyze and measure the effects of CEO's psychological traits for problem-solving behavior and accordingly the firm-level performance. Also, Iran might provide a conservative setting in the sense that if the hypotheses are supported in this study, they are more likely to hold true in other settings, for instance in a country whose external environment is more predictable and less harsh due to political and economic stability of the country.

The empirical findings suggest that hope and resiliency have positive and significant effects on APS behavior of the CEOs. We conclude that optimism does not affect APS of CEOs as too optimistic leaders most likely rely solely on their existing knowledge to react to the problems rather than valid and rich information. However, combining all studied positive traits (i.e. hope, optimism and resiliency) together and forming a higher-order construct known as positive psychological trait (PPT) show a more strong correlation on APS, indicating that hopeful, optimistic, and resilient CEOs are more likely to adopt APS compared to a case in which a CEO,

for example, is just hopeful but not optimistic and resilient. In line with strategic decision making literature, we confirm that APS positively affects the organizational performance. Moreover, we support that harsh environment in Iran due to its political and economic conditions affects the problem-solving behavior of CEOs while confronting with the problems. As a matter of fact we recommend APS in high-velocity environments to mitigate the uncertainty perceived from the external environments.

This study contribute to the existing literature by offering an effective bridge between strategic management and organizational behavior. Although the effectiveness of APS at the strategic level (e.g. strategic decision making with rationality or comprehensiveness) is asserted in the literature, little empirical research is conducted to understand the psychological antecedents of this behavior mode. One potential reason is highlighted by Hambrick (2007) claiming that linking psychological norms, as micro-processes, to strategic actions, as macro-organizational phenomena, is rather difficult. This study is an attempt to link the micro and macro domains as Aguinis et al. (2011) call it as a new avenue in the management studies. Motivated by the gap in the literature, we scrutinize a less-studied dimension of the upper-echelon theory which is CEO's personality. Moreover, unlike many behavioral studies that focus on the negative side of individuals (i.e. human dysfunctions and failures), we put emphasis on positivism by explicating how individual's positive traits can contribute to the firm-level performance. We conclude that, positivism in individual's thoughts along with other firm-specific characteristics (e.g. managerial awareness, infrastructure, and organizational resources) is helpful to fully reap the benefits of APS adoption, as a superior behavior mode, in the context of managerial problem-solving.

Another theoretical implication of this study is to propose a new measure for APS. Although our measure for APS is borrowed from the literature of psychology for daily problems, it can be

used to gauge rationality or comprehensiveness in strategic decision-making. We also add to the growing body of literature in strategic management with regard to managerial cognitive capabilities and micro-foundations of dynamic capabilities. Particularly, in a research conducted by Helfat and Peteraf (2015), APS is introduced as a managerial cognitive capability essential for strategic change and eventually firm performance improvement. We believe that what we study as the positive psychological traits could be influential on the dynamic capability of senior managers to consider the problems as opportunities and respond to them in a comprehensive way (i.e. seizing capability). Finally, we address a number of implications for managers that would be useful to take into considerations. We promote positive traits and suggest the organizations to employ CEOs (and not only) with more positive attitudes. We also promote APS effectiveness for firm-level performance especially when the organization suffers from unpredictable changes and instability due to the harsh external environment.

The following section reviews the literature on positive psychological traits, and problem-solving behavior with a particular focus on APS. Then, in section 3, we develop our hypotheses and demonstrate the conceptual model to empirically examine. In section 4, research setting, methodology, and measures are thoroughly discussed. Research analysis consisting primarily of both measurement and structural models together with main the results are presented in section 5. In the discussion part (section 6), a summary of main findings, theoretical as well as managerial implications of the study are shown. Finally, we conclude with research limitations and potential questions to be explored for the future studies, in section 7.

## 2. Literature Review

### 2.1 Positive Psychological Traits

According to the definition, adopted by Peterson et al. (2009), positive psychological traits (PPT) represent the capacities of individuals to be hopeful, optimistic, and resilient. Traditional theories of individual's positivity in psychology conceptualize these capacities as traits rather than state (Block & Kremen, 1996; Snyder et al., 1991; Scheier & Carver, 1985). In this study, we also put stress on positive traits of hope, optimism, and resiliency as the capacities that individuals are born with. Traits, indeed, are in the DNA of the individuals thus stable over time, as opposed to states that are transitory and could change over time and across situations. Some studies suggest that these traits are alterable and could be developed over time though (Youssef & Luthans, 2007; Synder, 2000). This study focuses on three positively-oriented psychological traits of hope, optimism, and resiliency.

First, hope is widely known as a constant interaction of the goal-orientation perception and the motivation to meet goals (Youssef & Luthans, 2007; Luthans, 2002, Snyder, 1995). A considerable consensus in the literature indicates that hope is constituted of two components. One is "*agency thinking*" that provides the determination to achieve goals and the second one is "*pathways*", as the word implies, to promote the generation of workable alternatives to achieve the desired goal (Luthans et al., 2007; Snyder, 1995). The second positive psychological trait is optimism. Optimism is described also as a goal-based construct which is associated with individual's positive expectations about the future even in the face of adversities and difficulties (Luthans et al., 2007; Scheier & Carver, 1985). Third is resiliency defined as the capacity of individuals to effectively and quickly rebound and bounce back from negative events and failures to attain success (Luthans et al., 2007; Tugade & Fredrickson, 2004).

Studying the psychological attributes of individuals in various domains is grabbing a lot of attention in the literature. Seligman (2002) emphasizes individuals and their psychology to achieve an optimal functioning, business excellence, and growth. Prior literature in management also investigates the importance of human traits on work outcomes such as job satisfaction (Therasa & Vijayabanu, 2015), organizational commitment (Bharat Chandra & Surendra Kumar, 2015), employee's performance (Avey et al., 2010), and even top management team dynamics (Peterson et al., 2003). Youssef and Luthans (2007) investigate the impact of PPT on these work-related outcomes and delineate how hope, optimism, and resiliency contribute to employee performance, job satisfaction, work happiness and organizational commitment. There is also a considerable consensus among researchers regarding the relevance of studying the psychological traits at the strategic level. According to resource-based view, Luthans et al. (2007a), introduce psychological positivism as a newly-emerging human-based resource to achieve sustainable competitive advantage. Previous studies indicate that, strategic outcomes and decisions such as strategic flexibility (Nadkarni & Herrmann, 2010), corporate social responsibility (Tang et al. 2017), entrepreneurial intention (Espíritu-Olmos & Sastre-Castillo, 2015), and transformational leadership (Aydogmus et al., 2018) could be influenced by human emotions and psychological attitudes. For instance, Peterson et al. (2009) empirically demonstrate that transformational leadership mediates the positive relationship between positive psychological traits and the firm performance. The reason is clear though. Psychological traits tend to shape and influence the individual's behavior at the workplace including the leadership behaviors at the strategic level (Nadkarni & Herrmann, 2010; Peterson et al, 2009).

Later, we show how the positive traits of hope, optimism, and resiliency can contribute to the work-place behavior. In particular, we indicate the way positive attitudes of CEOs can relate to the way they decide and make strategic actions at the upper-management level of the organization.

## **2.2 Analytical Problem-Solving**

Prior literature has identified two distinct behavioral attitudes for problem-solving (e.g. Choo et al., 2015; Baer et al., 2013; Repenning & Sterman, 2002) and decision making (e.g. Priem et al., 1995; Schwenk, 1995). Drawing from dual-process theory (Evans & Stanovich, 2013), one behavioral attitude is based on intuitive reasoning to overcome the problem temporarily. Intuitive problem-solvers jump to a solution, i.e. application of shortcuts and heuristics, without deep reasoning and sufficient problem understanding, with minimal cognitive efforts. The second attitude, conversely, is deliberate and reflective efforts relying on analytical reasoning and a stepwise framework to solve the problem fundamentally. However, an analytical problem-solver is required to go through a series of stages for problem analysis (i.e. problem definition, problem analysis, and solution design) before the final decision is reached (e.g. Smith, 1988). We label these behavioral attitudes intuitive problem-solving (IPS) and analytical problem-solving (APS), respectively. The reason is that these terms provide a comprehensive explanation regarding the nature of each, from a cognitive perspective. Unlike IPS that skips or abbreviates steps of a logical behavior (e.g. Baer et al., 2013; Schroeder et al., 2008; Lyles & Mitroff, 1980), APS as the term implies, assumes a stepwise behavior that links a problem to a diagnosis and eventually to an appropriate solution through a systematic search process (Schwenk, 1995; Smith, 1989; Mintzberg et al., 1976). APS is commonly emphasized in strategic management literature where scholars employ the terms such as strategic problem formulation or strategic decision-making as an analytical behavior which consists primarily of generation, evaluation, and selection of alternative

solutions (Volkema, 1986; Ramaprasad & Mitroff, 1984; Mintzberg et al., 1976). In this regard, authors mostly stress rationality or comprehensiveness in decision making (Miller, 2008; Elbanna & Child, 2007; Hough & White, 2003; Fredrickson, 1984).

Problems at the strategic level (mainly strategic decisions) conceived of as ill-structured problems that are characterized by uncertainty, unknown and complex relationship for problem-solvers to deal with (von Hippel & von Krogh, 2016; Ellspermann et al., 2006; Cowan, 1991; Smith, 1988). APS should be encouraged in order to gather relevant and necessary information to cope with these uncertain and difficult-to-manage problems. Information as a dimension of APS plays the most significant role to structure the problem and reduce the uncertainty (Baer et al., 2013). However, this could be done through a systematic construction of goals as well as a thorough investigation of alternatives, i.e. APS adoption (Huff & Reger, 1987). In line with the literature on rational or comprehensive decision-making, we consider APS as a pattern of behaviors developed by individuals aimed at solving the managerial problems fundamentally or make the strategic decisions appropriately at the upper-management level of the organization.

### **3. Theoretical Development & Hypotheses Development**

#### **3.1 Positive Psychological Traits and APS**

*Hope-* Snyder (1995) defines hope as “the process of thinking about one’s goals, along with the motivation to move toward and the ways to achieve those goals”. This comprehensive definition addresses two main components as (a) agency and (b) pathways. The former is a cognitive willpower or motivation to pursue the goals, while the latter refers to the ability of individuals to generate different routes to achieve the goals. Indeed, hope not only reflects an individual’s determination for goals to be achieved but also emphasizes a capability to consider different routes to attain the goals (Luthans, 2002). However, agentic thinking and pathways are complement in

the sense that they are both extremely necessary for the achievement of hopeful thoughts (Snyder et al., 1996). In other words, when a path to achieve the goal is blocked, hopeful individuals are expected to seek other alternatives to reach the same goal (Luthans et al., 2007). Hopeful people seem to be positive and tend to be more certain regarding the goals even in difficult and complex situations. As such, it is considered as a positive psychological trait (Peterson et al., 2009; Luthans & Youssef, 2007; Luthans, 2002), relevant to our study as well.

The two main components of hope, agency and pathways, are consistent with the activities of the comprehensive problem formulation following APS. The first step of APS is problem definition that refers to a set of actions in order to identify the problem precisely as well as the goals to reach. Indeed, goal-setting in problem-definition phase is exactly in line with the agency component of trait hope. APS also emphasizes solution design aiming at generating, evaluating and selecting solution alternatives. Relying on different alternatives and picking the most appropriate solution among them, representing the second component of trait hope (i.e. pathways), seem to be also an ideal profile for analytical problem-solvers. Therefore, the first hypothesis emerges as the follows:

H<sub>1</sub>: Hope is positively associated with APS of the CEOs.

The ability and the motivation of individuals to achieve goals are key determinants of success. However, Schulman (1999) adds a third critical component necessary for achievements to the list which is optimism. “The ability to succeed and the desire to succeed are not always enough without a belief that one will succeed” (Schulman, 1999, p. 31).

Optimism- Based on the definition by Scheier and Carver (1985) optimism is a belief that always good things, rather than bad things, occur. Similarly, Luthans et al. (2007) conceptualize it

as a way to positively view the world in any given situation. According to this study, having just a positive attitude is necessary but not sufficient. Optimistic people are also required to have a reasonable rationale behind such positive attitudes and expectations.

Optimistic leaders are more likely to consider daily-life-problems as the capabilities to learn from rather than failures to be avoided and as a consequence view the adversity as a new challenge to transform the failures into opportunities to success (Luthans et al., 2005; Schulman, 1999). Therefore, optimism can be also interpreted as a goal-based positive trait that can affect individual's behavior to make an undesirable situation into a desired one. Linking it to problem-solving behaviors of individuals, we claim that it is nearly impossible for an analytical problem-solvers to succeed without a strong belief of dealing with potential impediments and failures while formulating a problem. Indeed, the belief to have a positive expectation in any given situation (even in the face of difficulties) together with a rationale behind that could make analytical problem-solvers consider the problems as the opportunities to learn and improvement rather than liabilities to avoid (Mac Duffie, 1997; Argyris, 1976). As such, optimism seems necessary for APS in order to trigger a set of actions to successfully overcome the observed obstacles. So, this is possible to claim the following hypothesis:

H<sub>2</sub>: Optimism is positively associated with APS of the CEO.

Resiliency- Masten (2001) defines resiliency as a judgment “to have good outcomes in spite of serious threats to adaptation or development”. Studies in psychology, consensually interpret resiliency as a capability for adjustment and development under uncertain, stressful and threatening conditions (Luthans et al., 2007; Block & Kremen, 1996). For instance, Tugade and Fredrickson (2004) address resiliency by emphasizing the capability of individuals to bounce back from the stressful situation quickly and effectively. This trait seems also relevant to our study since

it also refers to staying positive and successfully coping with adversity, uncertainty, and failures as the common feature of the workplace. Coping with ill-structured problems, characterized by uncertainty, novelty, and open-endedness, is complex (Mintzberg et al., 1976). Hence, it is plausible to claim that APS is subject to setbacks meaning that failures could happen while identifying the major sources of the problem, developing a set of alternatives and selecting among them. In this setting, resiliency plays a critical role since it refers to the capability of individuals to recover quickly and bounce back even stronger in the face of difficulties and failures they face (Tugade & Fredrickson, 2004) while formulating a problem. In addition, facing a problem converts the ideal situation into a diverse one. So the more resilient an analytical problem-solver, the higher capability to manage this difficult situation. This includes adjustment, development, and achievement of the positive change. So, the third hypothesis to be tested is as follows:

H<sub>3</sub>: Resiliency is positively associated with APS of the CEO.

It should be stipulated that we make a distinction between these positive psychological traits. Although hope, optimism, and resiliency share some characteristics as they are all positive capacities, there have considerable differences. For instance, hope and optimism are proactive attitudes (i.e. cognitions and feeling about the future) whereas resiliency is more a reactive approach in the face of adversity (Peterson et al., 2009; Luthans et al., 2007; Youssef & Luthans, 2007). As a consequence, initially, we consider them individually and analyze the effects of each on APS separately.

### **3.2 APS of CEO and Organizational Performance**

The upper-echelon theory highlights the organization as a reflection of its top managers (Hambrick, 2007; Chaganti & Sambharya, 1987; Hambrick & Mason, 1984). Organizational outcomes such as strategic choices and accordingly the firm-level performance considerably

depend on top managers such as CEOs and their characteristics (Quigley & Graffin, 2017; Quigley & Hambrick, 2015; Mackey, 2008). However, the CEO effect is mainly due to leadership behavior (Mackey, 2008; Collins, 2001) and their critical decisions at the strategic level of the organization (Tichy & Cohen, 1997; Hart & Quinn, 1993). For example, Collins (2001) highlights the importance of an effective leadership for organizational success. In his book “*good to great*”, he addresses “level 5 leadership” necessary for the CEOs to move the organization from good to great. Hart and Quinn (1993) also introduce a good leader as a vision setter, motivator, analyzer and task-master that can assist the organization to advance its performance. In a similar vein, Waldman et al. (2001) highlight charismatic leadership as a determinant of performance in uncertain environmental conditions and argue that organizational success could be guaranteed through vision articulation, determination and communication of high performance expectation. In this study, we put stress on problem-solving behavior of the CEO, as one important dimension of the leadership, to solve the problems at the strategic level.

Along with the leadership literature, existing studies in strategic decision making strongly suggest the rational-comprehensive decision making (i.e. APS) to achieve the high performance as well. As a matter of fact, many empirical studies report the positive relationship between APS and firm-level performance (e.g. Goll & Rasheed, 1997; Dean & Sharfman, 1996; Priem et al., 1995). The reason is that APS enables CEOs to gather relevant and necessary information to structure the problem and make the best decision as a consequence (Baer et al., 2013; Dean & Sharfman, 1996). Therefore, it is possible to expect a positive relationship between APS behavior of the CEO with the organizational performance.

H4: APS of the CEO positively affects the organizational performance.

In a nutshell, in this study, we tend to introduce positive psychological traits of CEOs (i.e. hope, optimism, and resiliency) as the psychological antecedents of APS that, in turn, might affect the firm-level performance. The hypothesized scheme is depicted in Figure 1.

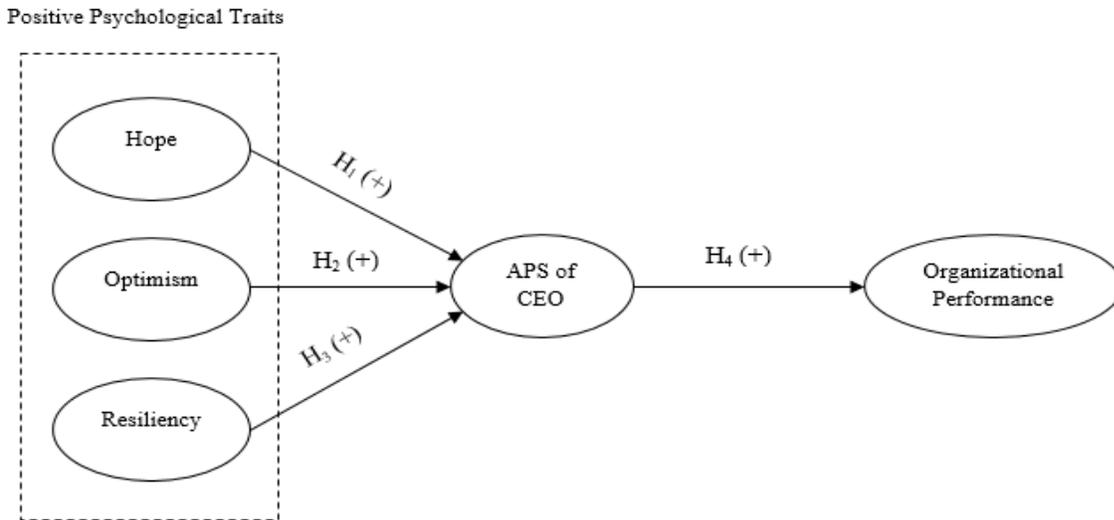


Figure 1, Hypothesized Scheme

## 4. Research Method

### 4.1 Sample

Cross-sectional data for this study is obtained from a sample of 373 observations (201 CEOs plus 172 followers) of small and medium-sized enterprises (SMEs) in Iran. This number of observations seems adequate since similar studies, at strategic level, have approximately the same sample size such as 121 (Peterson et al., 2009), 170 (Langabeer & DelliFraine, 2011) and 169 (Elbanna & Child, 2007) observations. We believe that Iran can provide an interesting setting for this study. The reason is that, Iran as the second largest economy in the Middle-East, is suffering from many problems in particular internal threats (e.g. high inflation rate, currency depreciation, increased rate of the unemployment rate) because of economic status of the country. These problems, also coupled with external threats related to unstable situation of the area, together with

heavy sanctions implemented due to political issues impose higher pressure to the organizations and makes the external environment harsher, more instable and riskier. So, we count on a premise that the environmental uncertainty represented by the turbulent and hostile environment affects problem-solving behavior of CEOs. This is also in line with the prior literature claiming that in emerging economies and developing countries (e.g. Iran), external environment plays a very critical role on the organizational performance (Elbanna & Child, 2007; Badri et al., 2000). Also, APS is recommended in the strategic decision making literature as a more effective behavior mode to cope with high-velocity environments (e.g. Child & Rodrigues, 2011; Mueller et al., 2007; Badri et al., 2000).

All in all, Iran gives us a good opportunity to study a less developed country subject to an extremely high environmental pressure. We adopt a conservative approach in our research setting which means that if our study hypotheses are supported in this setting, they are more likely to hold true in other settings, for example in a country whose external environment is not as turbulent and difficult-to-predict as Iran due to its political and economic stability.

Additionally, we focus on particularly micro, small and medium-sized firm in the private sector. The reason is that they receive less support from the government compared to the large and publicly-governed companies. So, in line with the reason of choosing Iran, SMEs might be more affected by the harsh environment and this setting could provide us helpful insights to discover if CEOs react quickly as an immediate response to this high external uncertainty (i.e. IPS adoption) or they still prefer to solve the problems fundamentally (i.e. APS adoption). Moreover, SMEs play an important role in the economy of developing countries, in particular for emerging status of Iran's economy (Benis, 2014). For instance, 50-60 % of job opportunities and accordingly the economic development of the country depends on its SMEs (Molanezhad, 2010; United Nations

Industrial Development Organization, 2003). Most of the firms whose CEOs are interviewed in our study are located in the province of Tehran (the city of Tehran and small industrial cities nearby), as a highly industrialized region with a population that account for around 30 % of the total SMFs in Iran.

We gathered our data based on two waves of observations for CEOs to understand if the sample is representative enough ( $N_1=120$ ,  $N_2=81$ ). The results indicate that the means of two sub-samples do not significantly differ in terms of demographic characteristics of respondents such as age of respondents ( $p=0.37$ ), their tenure ( $p=0.26$ ), and their educational level ( $p=0.8$ ). Hence, two-sample t-test demonstrates that our data is based on a representative sample of the population. In addition, our sample is drawn from diverse industries (both service-providers and manufacturing firms) and firms with diverse sizes. Studying various business sectors such as insurance providers, good producers, and trade companies, to name a few, may secure adequate representation of major industries in Iran and ensure the reliability of our sample. Table 1 summarizes the studied sample composition.

Table 1, Overview of Sample

Industry Type	Industry (Activity)	Sector Percentage	Industry Type Percentage	Tenure		Firm Size (Employees)	
				3-10	>=15	4-50 (Micro, Small)	>=50 (Medium)
Manufacturing Firms	Construction Activities	13 %	63 %	64 %	36 %	70 %	30 %
	Production of Agricultural Equipment	9 %					
	Production of Furniture	16 %					
	Production of Car Spare Parts	11 %					
	Oil, Gas and Petroleum	7 %					
	Production of Clothes	8 %					
	Food Producer	5 %					
	Health-Care & Cosmetic Producer	5 %					
	Others	26 %					
Service Providers	Trade	36 %	37 %	77 %	23 %	80 %	20 %
	Insurance	6 %					
	IT	7.5 %					
	Consultancy	21 %					
	Banking	4.5 %					
	Car-Service	4.5 %					
	Others	20.5 %					

The reason of having a lower number of observations in our sample for medium-sized firms is that most of the firms are either micro or small companies (92 %) in Iran. The medium-sized firms together with large ones contribute only around 6% to the economy of Iran<sup>6</sup>. Also, the majority of

<sup>6</sup> Based on a report by Iran Small Industries & Industrial Parks Organization (ISIPO) affiliated to the ministry of Industry, Mine, and Trade.

SMEs are manufacturing firms, in our sample, which is also consistent with a report for the United Nations Industrial Development (UNIDO) <sup>7</sup> claiming that most of small businesses (75 %) in Iran are operating in manufacturing fields. These are additional evidences to secure the adequate representations of our sample of Iranian SMEs. Note that most the respondents are man (87 %) which is not surprising due to cultural issue in Iran. With regard to the education, 49 % of CEOs obtained bachelor, 40 % had master, and 11 % got PhD degrees. As for age, 8 % of CEOs were in the range of in 18-30 years, 57 % belonged to the range of 31-45 years, and around 35 % more than 46 years.

## 4.2 Procedure

Common method bias (CMB) could be always a concern in this type of studies particularly when the primary data is obtained from a single person. Podsakoff et al. (2003) also discusses it as a serious concern for behavioral studies. However, we tried to mitigate this bias initially while designing the questionnaire in several ways. First, we did not rely on a single source of informants. Instead, we gathered our data based on two sources. Since this study is an attempt at the strategic level of the firms, CEOs were required to fill out the delivered questionnaire. Also, in order to reduce the response bias (i.e. social desirability bias as one potential source of CMB), we asked two followers to assess the problem-solving behavior of their CEO. These followers were selected based on their interactions with the CEO on a frequent base. The response rate of followers was quite high (86 %) meaning that in 172 cases, two followers evaluate their CEOs' problem-solving behavior. Second, we separated the questions for each construct in different sections of the questionnaire (Dillman et al., 2009). Third, all the questions were perfectly explained by one of

---

<sup>7</sup> Azarhoush et al., (2003). "To enhance the contribution of an efficient and competitive small and medium-sized enterprise sector. To industrial and economic development in the Islamic Republic of Iran". United Nations Industrial Development Organization (UNIDO).

the researchers for the respondents in case of doubts and misunderstandings, and they were asked to answer the questions based on what they are, and not the way they think they should be. We also assured the CEOs and more importantly the followers that their responses were kept anonymously. Forth, the questionnaire is balanced having dual statements by the help of both positively-worded statement and negatively-worded ones or reversed score (e.g. several questions were considered for pessimism while measuring optimism as the core construct). Similarly, we employed fillers in our questions for the aim of disguising the main purpose of the project (Malhotra, 2006).

To measure the variables, all the scales are directly taken from the prior literature (details in next section). In order to translate the standardized questionnaire, we followed the procedure proposed by Brislin (1980). To do so, one of the researchers as a native Persian<sup>8</sup> speaker who is also doing his research in English translated the original version into Persian. The Persian version was then re-translated back to English by an Iranian English-Persian translator. The English and the Persian versions of the questionnaire were compared carefully to ensure the discrepancies in terminology. The errors were then revised and the pre-final questionnaire was piloted with several Iranians as well. The doubts and thoughts were thoroughly investigated and the questionnaire was revised again and then launched.

---

<sup>8</sup> Persian is official language of Iranians

### 4.3 Measures

#### 4.3.1 Independent Variables: Hope, Optimism, and Resiliency

Hope, optimism, and resiliency, as the positive psychological traits of the CEO, are measurable (e.g. Peterson et al., 2009; Luthans et al., 2005). Below, we describe how to measure each based on already-developed and validated scales.

Hope- We measure hope using the 12-item “Trait Hope Scale” developed by Snyder et al. (1991). Some items refer to “pathways” as one component of construct hope, whereas the others record “agency”. CEOs are supposed to evaluate this trait based on an 8-point Likert-type scale (1= definitely false to 8= definitely true). Sample items include “I can think of many ways to get out of a jam” for pathway and “I energetically pursue my goals” for the agency.

Optimism- Optimism is measured using the 10-item “Trait Optimism Scale” (Scheier & Carver, 1985), anchored on a 5-point Likert-type scale (1= I strongly disagree, 5=I strongly agree). Sample questions to be answered are “I expect more good things to happen to me rather than bad ones”, “if something can go wrong for me, it will” (reversed score: pessimism).

Resiliency- Resiliency as the third positive psychological trait, is measured by the help of 14-item ego-resiliency on a 4-point Likert scale proposed by Block and Kremen (1996) (1= does not apply at all, 4= applies very strongly). One item representing ego-resilience is “I quickly get over and recover from being startled”.

#### 4.3.2 Analytical Problem-Solving Scale

For the construct of APS, we used a scale that captures the behavioral attitude of individuals to follow a rational and step-wise procedure in order to comprehensively formulate a problem. Maydeu-Olivares and D’Zurilla (1997) developed the *rational problem-solving* scale that refers to

a set of deliberate efforts and systematic application of problem-solving skills to fundamentally resolve the problems. Although this scale is developed in psychology literature for daily problems, it can be used also in management context. Therefore, we adapt it to focus on problems in workplace at strategic level. APS construct refers to a set of items indicating that CEOs rely heavily on valid information, rather than just their own prior experiences, for problem-solving. Items represent (a) problem detection and analysis, (b) generation of solution alternatives, (c) decision making regarding the best solution to take, (d) solution implementation and verification. We measured APS based on a 7-point Likert-scale (1= completely disagree, 7= completely agree). Sample statements are “when confronted with a problem, I stop and think about it before deciding on a next step”, or when considering solutions to a problem, I do not take the time to assess the potential success of each alternative” (reversed score).

### **4.3.3 Dependent Variable: Organizational Performance**

Organizational performance could be measured using both subjective and objective measures. However, it is quite common that CEOs refuse to provide real and accurate financial data to researchers because of their confidentiality considerations (Sapienza et al., 1988). They often say: “we should be very cautious about our organization and data on our economy” (Elbanna & Child, 2007, p.573). Hart and Banbury (1994) note that, in their study, just around 30% of CEOs are willing to provide objective data in particular the accounting-based measures of the firm performance. This limitation derives us to employ subjective perceptual measures in order to gauge the performance of the firm. We adopt the constructs initially proposed by Hart and Banbury (1994) and then classified by Elbanna and Child (2007) into two main groups as (a) financial and business performance and (b) organizational effectiveness. Respondents are asked for assessing their firm performance on each of the items, based on a 7-point Likert scale ranging from 1 (low

performer) to 7 (high performer), compared to that of other firms in the same market (i.e. competitors) for the last three years.

#### **4.3.4 Control Variables**

In this study, in order to ensure that omission of potentially significant variables do not affect our analysis, we control for several variables in 4 different types: (1) problem-specific characteristics, (2) environmental-specific characteristics, (3) demographic characteristics of CEOs, and (4) firm size, and industry type effect. The last two types of control variables are employed not only for their potential effects on our studied variables but also to control for heterogeneity of the sample.

*Problem-Specific Characteristics-* We control for two important characteristics of a problem that could affect CEO's choice for adopting APS or IPS. The first one is problem importance. Papadakis et al. (1998) point out that the impact magnitude of the problem or problem importance is recognized as the most considerable problem-specific characteristic for comprehensiveness in decision-making. Similarly, Elbanna and Child (2007) and also Dean and Sharfman (1993) highlight the significance of problem importance claiming that not all the problems are equally important from a strategic point of view. Therefore, CEOs tend to adopt APS for the problems that are important enough. We use a 5-point Likert scale from 1 (very low) to 5 (very high) to evaluate the importance of the problem. The second one is problem uncertainty. Elbanna and Child (2007) empirically address the substantial role played by uncertainty as a moderator of rationality-effectiveness relationship in strategic decision-making. CEOs are required to answer three questions in this regard (e.g. difficulty of predicting the outcomes) according to a 7-point Likert scale from 1 (definitely false) to 7 (definitely true).

*Environment-Specific Characteristics-* Both environmental dynamism and environmental hostility seem relevant to be controlled for. First, literature on strategic decision-making highlights the importance of environmental dynamism as an external factor that could affect rational decision-making and its effectiveness. Literature promotes that APS should be encouraged in high environmental turbulence (e.g. Child & Rodrigues, 2011; Mueller et al., 2007). For instance, Hough and White (2003) report a positive relationship between rational-comprehensive decision making and decision quality which is moderated by environmental dynamism. The reason is that in an unstable environment, characterized by intense competition, high technological development and unexpected changes in customer requirements (Duncan, 1972), APS could be helpful to reduce the external uncertainty. We adopt the construct proposed by Achrol and Stern (1988) anchored by a 7-point Likert scale from 1 (with no changes) to 7 (with extremely high changes) to investigate how turbulent the external environment is. This scale consists primarily of the items referring to the changes in marketing practices, competitor dynamism as well as customer dynamism.

Then, we control also for environmental hostility as another dimension related to external environment. Goll and Rasheed (1997) find that rational decision-making is strongly related to organizational performance in munificent environments. Conversely, Elbanna and Child (2007) support the association between strategic decision-making with rationality and decision effectiveness but in hostile environments. The measurement scale ranges from 1 (absolutely false) to 5 (absolutely true) as Khandwalla (1977) suggested.

Besides aforementioned reasons to control for environmental-specific characteristics emerged from the literature, environmental dynamism and hostility do matter regarding our research setting to target Iran as a country whose external environment is characterized by uncertainty due to political changes and instability in economic situation of the country.

Demographic Characteristics of CEOs- Hambrick and Mason (1984) state demographic characteristics of CEOs are influential for organizational outcomes such as firm-level performance. Based on the findings reported by Hitt and Tyler (1991) in an empirical study, these characteristics might influence APS. Therefore, in this study, we control for age, formal education (from high-school to Ph.D.) as well as tenure or work experience of CEOs in their positions. As for age. Younger CEOs are more likely to pursue riskier strategies like IPS for problem-solving (Hambrick & Mason, 1984). The reason is that youthful CEOs show risk propensity to jump to the solution without comprehensively formulating a problem (Miller, 2008). We use a continuous variable measuring CEO's age. Then we also control for CEO's level of education. High education level is directly linked with the information-processing capability of individuals (Wiersema & Bantel, 1992). It is plausible to note that well-educated CEOs tend to adopt APS because they are trained for thinking rather than feeling while confronting with a problem. In other words, they are less likely to be affected by the cognitive bias of jumping to the solution without comprehensively formulate the problem. According to Hitt & Tyler (1991), one 5-point scale is used to measure CEO's level of formal education (1= high school, 2= college, 3= bachelor, 4= master, 5= PhD). Lastly, we control for CEO's tenure as the number of years a CEO is in this position. According to Finkelstein and Hambrick (1990), firms led by long-tenured CEOs seem to prefer persistent and unchanging strategies. In this perspective, they show lower flexibility to adopt changes. Moreover, long-tenured CEOs are more likely to rely on their prior hypotheses and existing knowledge rather than valid information and hence they show lower tendency to adopt APS. For tenure, we also employ a continuous variable measuring the number of years the CEO is in this position. Finally, gender is considered using a dummy variable (1=male, 0=female).

Firm and Industry Type Effects- We also control for firm size. Many researchers investigate the effects of firm size on problem-solving such that larger firms are more likely to employ formal and rational processes while making a strategic decision (Fredrickson & Iaquinto, 1989). Also, Hart and Banbury (1994) empirically report the firm size as moderator of the strategic process-performance relationship. To ensure the adequate representation of our sample, we target different business sectors for both manufacturing firms and service-providers. So, we use a dummy variable for industry type effect (1=manufacturing, 0=service).

## **5. Research Analysis and Results**

### **5.1 Common Method Bias (CMB)**

First of all, in order to ensure the sufficient accuracy and reliability of responses, we implement a couple of preliminary tests on the main theoretical constructs of the study. These analyses are also helpful to check if we could successfully mitigate the common method bias (CMB) while designing the questionnaire initially.

For personality traits, we adopted a brief version of big-5 including 10 items regarding Extraversion, agreeableness, conscientiousness, emotional stability and openness to experiences (Gosling et al., 2003). This scale has reverse-scored item for each dimension. A sample question for *conscientiousness* of respondent, for example, is to evaluate himself as a dependable (self-disciplined) person. The reverse-scored item for the same trait is if he is disorganized (careless). The reason of checking the reliability of the answers for positive psychological traits with other personality traits (i.e. big-five) is that previous literature in psychology demonstrates a meaningful relationship between these two groups of traits and we can make sure whether CMB for item ambiguity bias (i.e. refers to ambiguous items that allow the respondents to answer to the questions systematically or randomly) and social desirability bias (i.e. tendency of respondents to answer to

the questions based on the social acceptability rather than their true feelings) is a concern. Most of the correlations between psychological and personality traits emerge as expected. Table 2 shows the Pearson's correlation between them.

Table 2, Pearson's Correlation between Positive Psychological Traits and Big-5 Personality Traits

Positive Traits	Big-Five Personality Trait									
	1	2	3	4	5	6	7	8	9	10
Hope	0.41**	0.04	0.14*	0.009	0.37**	- 0.23**	0.08	- 0.17*	0.30**	- 0.03
Optimism	0.56**	- 0.03	0.28**	- 0.18*	0.44**	- 0.42**	0.23**	- 0.16*	0.44**	- 0.08
Resiliency	0.41**	0.08	0.26**	- 0.17*	0.33**	- 0.26**	0.12	- 0.12	0.29**	- 0.01

*Note 1:* Extraversion: 1=Extraverted/ enthusiastic, 6R= Reserved/ quiet; Agreeableness: 2R= Critical/ Quarrelsome, 7= Sympathetic/ Warm; Conscientiousness: 3= Dependable/ Self-Disciplined, 8R= Disorganized/ Careless; Emotional Stability: 4R= Anxious/ Easily Upset, 9= Calm/ Emotionally Stable; Openness to Experience: 5= Open to New Experience/ Complex, 10R= Conventional/ Uncreative.

*Note 2:* \*\* p<0.01, \* p<0.05 (2-tailed)

The correlation results demonstrate the positive and significant relationships between positive psychological traits and positive emotions of personality traits (e.g. dependable, emotional stability, to name a few) and negative associations between hope, optimism and resiliency with negative emotions of personality traits (e.g. disorganized, conventional, to name a few). As an example, we find a positive and statistically significant correlation between hope and extroversion. The reason is that extroverted individuals are energetic and active who are more likely to engage in learning goal orientation, as a key component of trait hope, through acquiring necessary skills (Halama, 2010; Zweig & Webster, 2004). Hope and conscientiousness are also positively correlated as they both are recognized as the achievement-oriented traits to first plan the goals and then follow up the success in a disciplined way (Klockner & Hicks, 2008). In addition, hope is characterized by self-discipline and thus it is negatively related to mental disorganization. The meaningful relationships between positive psychological traits and big-five personality traits

attests that we can rely on the responses provided by CEOs regarding hope, optimism, and resiliency.

As for organizational performance, for those cases where both subjective and objective performance measures are available, we performed the correction test. The correlation between subjective and objective performance measures for ROA was significant ( $\beta= 0.49$ ,  $p<0.05$ ). Also, subjective and objective measures of profitability were significant ( $\beta= 0.57$ ,  $p<0.05$ ). This seems in line with previous literature claiming that subjective assessment of firm performance reported by senior managers is strongly correlated with the objective ones (Dess & Robinson, 1984). Hence, in our analysis, we rely on subjective measures for organizational performance provided by CEOs.

For APS of CEOs, as discussed earlier, we asked two followers to evaluate the way their leaders (i.e. CEOs) approach and respond to the problems. We targeted the followers as the ones who interact with CEOs on a frequent base. Examples could be a financial manager, a member of the board of directors or even an external business consultant. Then, we compute the correlations between CEO's responses and the average of responses of two followers for the purpose of evaluating the problem-solving behavior of their CEOs. The response rate of followers was quite high (86 %) <sup>9</sup>. However, in those case in which there is no follower (9 %) or just one follower is available (5 %), we count on the answers of CEO or just that one available follower, respectively. Also, ICC (1) is calculated to determine the level of interrater reliability between CEO's responses and the followers'. This value is 0.34 which exceeds 0.1 cutoff suggested by Bliese (1998). Therefore, the responses of followers are averaged to generate CEO's APS.

---

<sup>3</sup> Note that followers were required to answer just 9 questions related to APS and not the whole questionnaire.

All in all, we claim that we can rely on the responses provided by informants (i.e. CEOs and the followers) for the main theoretical constructs and hence CMB, such as social desirability or item ambiguity bias, is less likely to threaten our findings.

## 5.2 Measurement Model

Exploratory Factor Analysis (EFA): First, we implement an EFA to verify the factor structure of the model for the Iranian context. EFA based on maximum likelihood using promax rotation produces 5 factors with eigenvalues greater than 1. The items for hope, optimism, resiliency, APS and organizational performance are loaded into 5 various factors. So, in this study, unlike other efforts (e.g. Peterson et al., 2009), we consider hope, optimism, and resiliency separately as distinct traits. The five-factor model explains 63 % of the total variance. Moreover, Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) is 0.93 which shows a good model fit with our data. It should be stipulated that, redundant items are dropped out due to lack of salient loading values (less than 0.3), weak loadings (lower than 0.6), and cross-loadings between items. Table 3 summarizes the main results of the EFA including the loading values, construct reliability (CR), average variance extracted (AVE) as well as Cronbach's alpha.

Table 3, EFA Factor Loading, CR, AVE, and Cronbach's Alpha

Items	Loading	Mean/SD	CR	AVE	Cronbach's Alpha
<b>APS1:</b> When a solution to a problem was unsuccessful, I do not examine why it didn't work.	0.737	4.2/1.23	0.88	0.53	0.89
<b>APS2:</b> After I have tried to solve a problem with a certain course of action, I take time and compare the actual outcome to what I thought should have happened.	0.681	4.5/1.18			
<b>APS4:</b> When deciding on an idea or possible solution to a problem, I do not take time to consider the chances of each alternative being successful.	0.626	4.3/1.07			
<b>APS5:</b> When confronted with a problem, I stop and think about it before deciding on a next step.	0.735	4.5/1.12			
<b>APS6:</b> When making a decision, I weigh the consequences of each alternative and compare them against each other.	0.853	4.4/1.16			

<b>APS7:</b> I try to predict the overall result of carrying out a particular course of action.	0.577	5/0.89			
<b>APS9:</b> When I am confused by a problem, one of the first things I do is survey the situation and consider all the relevant pieces of information.	0.860	4.4/1.10			
<b>Hope1:</b> I can think of many ways to get out of a jam.	0.730	5.08/1.56	0.91	0.58	0.92
<b>Hope2:</b> I energetically pursue my goals.	0.716	5.46/1.52			
<b>Hope4:</b> There are lots of ways around any problems.	0.729	5.23/1.65			
<b>Hope6:</b> I can think of many ways to get the things in life that are most important to me.	0.798	5.16/1.64			
<b>Hope8:</b> Even when others get discouraged, I know I can find a way to solve the problem.	0.846	5.22/1.59			
<b>Hope9:</b> My past experiences have prepared me for the future.	0.677	5.72/1.43			
<b>Hope10:</b> I've been pretty successful in life.	0.825	5.4/1.49			
<b>Hope12:</b> I meet the goals that I set for myself.	0.792	5.3/1.58			
<b>Optimism1:</b> In uncertain times, I usually expect the best.	0.820	3.73/1.10	0.93	0.70	0.94
<b>Optimism3:</b> If something can go wrong for me, it will.	0.745	3.87/1.11			
<b>Optimism4:</b> I am always optimistic about my future.	0.901	3.81/1.14			
<b>Optimism7:</b> I hardly ever expect things to go my way.	0.761	3.72/1.04			
<b>Optimism9:</b> I rarely count on good things happening to me.	0.908	3.74/1.12			
<b>Optimism10:</b> Overall, I expect more good things to happen than bad	0.894	3.74/1.11			
<b>Resiliency2:</b> I quickly get over and recover from being startled	0.836	2.98/0.76	0.90	0.58	0.90
<b>Resiliency3:</b> I enjoy dealing with new and unusual situations	0.689	3/1			
<b>Resiliency6:</b> I am regarded as a very energetic person	0.559	2.94/0.86			
<b>Resiliency10:</b> I usually think carefully about something before acting	0.801	3.12/0.76			
<b>Resiliency11:</b> I like to do new and difficult things	0.961	2.95/0.9			
<b>Resiliency12:</b> My daily life is full of things that keep me interested	0.767	3.06/0.91			
<b>Resiliency13:</b> I would be willing to describe myself as a pretty "strong" personality	0.654	2.99/0.95			
<b>Organizational Performance1:</b> Return on assets (ROA) over the last 3 years compared to your competitors	0.877	4.9/1.42	0.92	0.67	0.92
<b>Organizational Performance2:</b> Operating Profits over the last 3 years compared to your competitors	0.848	4.98/1.39			
<b>Organizational Performance3:</b> Market share over the last 3 years compared to your competitors	0.914	5/1.46			
<b>Organizational Performance4:</b> Growth rate of sales (or revenues) over the last 3 years compared to your competitors	0.817	4.96/1.37			
<b>Organizational Performance7:</b> Quality of product (or service) over the last 3 years compared to your competitors	0.710	5.12/1.15			
<b>Organizational Performance9:</b> Efficiency of Operation over the last 3 years compared to your competitors	0.740	4.97/1.20			

Moreover, the absences of extremely high correlation coefficients between the items ( $< 0.7$ ) together with low inspection of variance inflation factors (VIF) among variables (the highest is 1.5) attests that multicollinearity is not a concern (Hair et al., 2010).

Confirmatory Factor Analysis (CFA): We also conducted a pooled CFA to confirm the proposed factor structure. The results support the hypothesized 5-factor structure with appropriate construct validity and satisfactory fit statistics <sup>10</sup> (ChiSq/df=1.18, CFI=0.98, TLI= 0.97, IFI =0.98, RMSEA= 0.03). The convergent validity is achieved since all the items are statistically significant ranging from 0.62 to 0.91 ( $p<0.001$ ). AVEs for every construct are greater than the acceptable value of 0.5. The correlation values between the constructs do not exceed 0.85 indicating that the measurement model has a good discriminant validity. Finally, the content validity is assumed since all scales are taken directly from the prior literature.

To safeguard against CMB even after the model validation (using EFA and CFA), two additional steps are taken. First, we perform Harman's one factor test by loading all items of the constructs into an exploratory factor analysis using unrotated factor solution (Podsakoff et al., 2003). One factor model explains just 35 % of the total variance in the variables which does not account for the majority of total variance suggesting that CMB is less likely to occur. Second, we implement a single-factor model employing a confirmatory factor analysis. In this methodology, following Podsakoff et al. (2003), we control for the effects of an unmeasured latent factor and compare the standardized regression weights of a model having a common factor with common variance bias (CVB) with a model without a common factor (no CVB). The difference between these regression estimates, in two defined scenarios, demonstrate no difference (we consider a

---

<sup>10</sup> Chisq/df= Chi Square/ Degrees of Freedom, CFI= Comparative Fit Index, TLI= Tucker-Lewis Index, IFI= Incremental Fit Index, RMSEA= Root Mean Square Error of Approximation

threshold of 0.3 as initially employed in our EFA). So we claim that CMB is not an issue in this study.

Descriptive statistics, correlations among the constructs of the measures are provided in Table 4. Also, we assess the discriminant validity of the measures and find that the square root of the average variance extracted is greater than the absolute values of the correlations between the factors, as reported in Table 4.

Table 4, Descriptive Statistics, Correlations among Composite Factors, and Discriminant Validity

No.	Construct	M	SD	1	2	3	4	5
1	APS	4.5	0.88	<b>0.73</b>				
2	Hope	5.3	1.25	0.5**	<b>0.76</b>			
3	Optimism	3.8	0.97	0.45**	0.49**	<b>0.83</b>		
4	Resiliency	3	0.70	0.48**	0.47**	0.51**	<b>0.76</b>	
5	Firm Performance	5	1.14	0.44**	0.34**	0.44**	0.28**	<b>0.81</b>

*Note1:* Numbers on the diagonal (bold values) show square roots of AVE and numbers below the diagonal demonstrate the correlations between main study variables.

*Note2:* \*\* Correlation is significant at the 0.01 level (2-tailed)

### 5.3 Structural Model

We employ a structural equation modeling (SEM) approach to test our hypotheses. This method simultaneously estimates the latent variables as well as the causal relationships between them.

We test different SEM models with 201 observations. For example, we test our SEM model just with composite factors (i.e. hope, optimism, resiliency, APS, and organizational performance). Then, we add control variables into the SEM model in different steps. In all examined SEMs, model fit indexes are satisfactory (e.g. for the SEM model just with composite factors: chi-square/df=1.2, CFI=0.97, TLI=0.97, IFI=0.97, RMSEA=0.03). However, we just report the results of full model with all the variables included into the analysis.

Full model is tested with main theoretical constructs (i.e. hope, optimism, resiliency, APS, and organizational performance) controlling for the problem-specific characteristics (i.e. problem

importance and problem uncertainty), environment-specific characteristics (i.e. environmental dynamism and environmental hostility), demographic characteristics (i.e. education, age, gender, and tenure), industry type (manufacturing or service) as well as the firm size (i.e. the number of employees). Note that 33 observations are dropped due to some missing values involving demographic characteristics of CEOs.

Our findings illustrate that, trait hope positively affects APS of CEOs ( $\beta = 0.34$ ,  $p < 0.01$ ), thus H1 is supported. This is in line with the finding reported by Maydeu-Olivares and D’Zurilla (1997) claiming that, in a univariate correlation analysis though, rational-based problem-solving skills (i.e. APS) has a negative and significant relationships with hopelessness ( $\beta = -0.35$ ,  $p < 0.05$ ). We conclude that, hopeful people tend more to adopt APS. As a matter of fact, two components of trait hope known as “agency thinking” and “pathways” are consistent with the steps in APS in order to comprehensively solve the problem. Agency thinking, as a capacity of individuals for goal-setting is consistent with a set of actions required in order to carefully define the problem (i.e. problem definition). Pathways, refers to the capability of individuals to consider different routes to achieve the goals, is in line with solution design phase of APS where problem-solvers need to consider different alternatives and select the most appropriate one among them.

H2 is not supported as the correlation between optimism and APS is insignificant. However, this result does not seem surprising. The reason could be due to the false or unrealistic optimism (Youssef & Luthans, 2007; Schneider, 2001). In other words, too optimistic decision-makers are more likely to rely solely on their pre-existing knowledge rather than valid information using an analytical reasoning. Also, Langabeer and DelliFraine (2011) demonstrate that there is a positive correlation between optimism in CEOs and incrementalism, as opposed to rationality in strategic decision making (i.e. APS). Based on this study, optimism is introduced as a cognitive bias and

the authors propose that optimistic executives are more likely to ignore the reality and assume the best of situation without adequate and realistic considerations.

The positive and significant association between resiliency and APS illustrates that H3 is supported ( $\beta= 0.25$ ,  $p<0.01$ ). Indeed, resilient people prefer APS to approach and respond to the problems. The reason is that, coping with ill-structured problems is complex and there is a high probability of failure while formulating the problems. In this regard, resiliency seems necessary for the analytical CEOs to easily recover from setbacks, bouncing back to achieve success.

Moreover, we find support for H4 as there is a positive and strong effect of APS on the organizational performance ( $\beta= 0.50$ ,  $p<0.01$ ). We, indeed, additionally confirm a huge body of literature in strategic management claiming that rational or comprehensive decision making ameliorates the firm performance (e.g. Goll & Rasheed, 1997; Dean & Sharfman, 1996; Priem et al., 1995).

For two control variables identified for problem-specific characteristics, problem uncertainty (PC) has a positive and statistically significant effects on APS ( $\beta= 0.14$ ,  $p<0.1$ ). As a matter of fact, the more uncertain the problem, the more likelihood of APS adoption for CEOs while resolving the problems. Regarding environment-specific characteristics, environmental dynamism (ED) emerges influential for APS for CEOs while solving problems and making decisions ( $\beta= 0.19$ ,  $p<0.1$ ). In other words, when environmental dynamism is extremely high, CEOs are more likely to adopt APS for approaching and responding to the problems they face.

Among other control variables, industry type seems to be effective on APS of the CEOs. Indeed, CEOs of manufacturing firms, compared to their counterparts in service-providers, are more likely

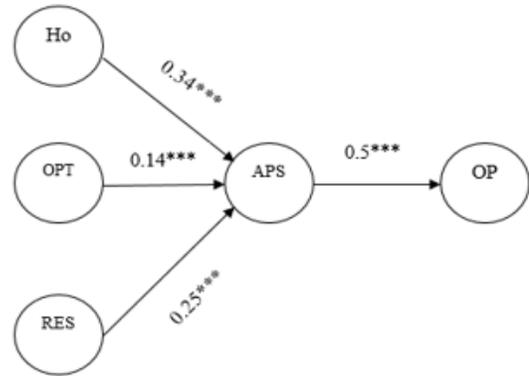
to adopt APS for problem-solving. This model also shows acceptable values for absolute, incremental, and parsimonious fit (chi-square/df=1.4, CFI=0.9, TLI=0.9, IFI=0.9, RMSEA=0.05).

All in all, we confirm that hope and resiliency as positive psychological traits can increase the likelihood of APS. APS adoption, in turn, leads to amelioration of the organizational performance.

Summary of findings are reported in Table 5.

Table 5, Full SEM Model

Hypothesized Relationships	Full Model		
	Est.	S.e.	Sig.
Hope → APS	0.34	0.09	***
Optimism → APS	0.14	0.1	
Resiliency → APS	0.25	0.08	***
APS → OP	0.5	0.06	***
PI → APS	0.12	0.1	
PU → APS	0.14	0.07	*
ED → APS	0.19	0.08	*
EH → APS	-0.03	0.08	
Education	0.08	0.07	
Age	0.07	0.11	
Male	0.002	0.08	
Tenure	-0.05	0.09	
Firm Size	0.05	0.06	
Manufacturing Firms	0.14	0.07	*
Fit Indexes	$\chi^2/df$	1.4	
	CFI	0.9	
	TLI	0.9	
	IFI	0.9	
	RMSEA	0.05	
Sample Size	168		



\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, dummy variable for gender (1=male, 0=female), and dummy variable for industry type (1=manufacturing firm, 0=service firm)

## 5.4 Additional Analysis

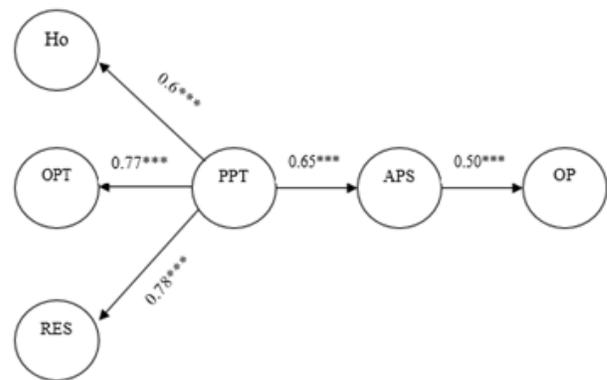
Although EFA showed that a five-factor model fits the data well, we also test the SEM models with three factors of (1) where hope, optimism and resiliency jointly form a higher-order construct known as positive psychological traits (PPT), (2) APS, and (3) organizational performance. The reason is that some previous studies (e.g. Peterson et al., 2009; Luthans et al., 2005) combine hope,

optimism, and resiliency into a core construct of psychological capital. Moreover, we argue that hope, optimism and resiliency share some common characteristics as they are all recognized as the positive traits. In this regard, they might reinforce each other for broader thinking, functioning and well-being due to the complementarity and synergy effects (Fredrickson & Joiner, 2002). As a consequence, we form PPT to see if the estimate of interest significantly change.

The model fit indexes still remain acceptable with no significant changes compared to previous models. Table 6 reports the estimates and standard errors as well as the model fit indexes for the full model.

Table 6, Full SEM Model (PPT as a Higher-Order Construct)

Hypothesized Relationships		Full Model		
		Est.	S.e.	Sig.
PPT → APS		0.65	0.08	***
Hope → PPT		0.60	0.05	***
Optimism → PPT		0.77	0.04	***
Resiliency → PPT		0.78	0.04	***
APS → FP		0.50	0.06	***
PI → APS		0.14	0.09	
PU → APS		0.13	0.07	*
ED → APS		0.16	0.07	**
EH → APS		0.004	0.08	
Education		0.10	0.07	
Age		0.09	0.1	
Male		- 0.005	0.08	
Tenure		-0.07	0.09	
Firm Size		0.063	0.06	
Manufacturing Firms		0.12	0.07	*
Fit Indexes	X <sup>2</sup> /df	1.4		
	CFI	0.9		
	TLI	0.9		
	IFI	0.9		
	RMSEA	0.05		
Sample Size		168		



\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, dummy variable for gender (1=male, 0=female), and dummy variable for industry type (1=manufacturing firm, 0=service firm)

According to the results, we claim that PPT as a core psychological construct, formed by hope, optimism, and resiliency, positively affects APS. However, the magnitude of its impact is greater in a comparison with a situation in which the effects of hope, optimism, and resiliency separately

on APS are investigated. So it is possible to claim that PPT, as a core construct, is more influential on the APS of the CEO compared to hope, optimism and resiliency taken in isolation.

Also, with no significant changes compared to our previous findings, APS always improves the organizational performance as the estimate for APS-organizational performance relationships is positive and significant. Like the previous case, problem uncertainty (PC) and environmental dynamism (ED) are influential on APS. Among demographic characteristics of CEOs, firm size, and industry type effect, just the last one seems effective on APS as CEOs in manufacturing firms are more likely to adopt this behavioral attitude for resolving the problems.

Next, we also check if there is a direct impact of PPT on organizational performance in our full model. The results show that we could observe a direct effect from PPT on firm performance as well. The coefficient is 0.34 which is statistically significant ( $p < 0.05$ ). In this setting, the coefficient between PPT and APS is significant ( $\beta = 0.62, p < 0.01$ ), as well as the one between APS and organizational performance ( $\beta = 0.27, p < 0.05$ ). The model fit indexes are approximately similar to the last model (chi-square/df=1.44, CFI=0.89, TLI=0.89, IFI=0.9, RMSEA=0.051). Then, since both direct and indirect effects from PPT on organizational performance are found, it is plausible to conclude that APS fully mediates PPT-organizational performance relationship. However, an indirect impact seems more reasonable from both theoretical framework and empirical results. For theoretical framework, we argue that PPT activates the analytical attitude of CEOs for thinking and reasoning (i.e. APS) and is eventually effective for organizational performance. In other words, hope, optimism, and resiliency jointly affect the firm performance through the CEO's tendency to engage in APS to solve the problems. From an empirical point of view, the model fit indexes of having indirect relationships between PPT and organizational

performance (through APS) without the direct one from PPT and organizational performance are better than the case in which both direct and indirect relationships are investigated.

Also, since the positive effect of optimism on APS is not supported, shown in the previous part, we exclude optimism and form the PPT just with hope and resiliency. The results still hold true illustrating the positive and significant relationships between PPT and APS ( $\beta = .70$ ,  $p < 0.01$ ) and between APS and OP ( $\beta = .49$ ,  $p < 0.01$ ). However, the model fit indexes are lower than having three of them for PPT ( $\chi^2/df = 1.4$ , CFI=0.89, TLI=0.88, IFI=0.88, RMSEA=0.06).

## **6. Discussion**

As a compelling literature stream emphasizes the importance of senior executives for organizational success (e.g. Quigley & Graffin, 2017; Collins, 2001; Hambrick & Mason, 1984), it seems crucial to investigate how positive emotions and attitudes of CEOs, as the less-investigated dimension of upper-echelon theory, can shape their problem-solving behavior, at the strategic level. Linking traditional positivism theories to the upper-echelon theory can shed light to answer this substantially important, mostly neglected though, question. Our research addresses the positive psychological traits of CEOs and develops and examines a model for analytical problem-solving, as a reflection of leadership capability of CEOs, its psychological antecedents, and its effects on firm-level performance. More specifically, the major purpose of this study is to scrutinize whether, or not, positive psychological traits (i.e. hope, optimism and resiliency) could enhance or inhibit the analytical problem-solving behavior of CEOs and eventually the organizational performance. Based on an Iranian sample using a SEM, we empirically show that the more hopeful and resilient CEOs, the more likelihood of APS adoption. Indeed, we empirically support the proposition by Hambrick (2007) that psychological attributes shape the executive behavior and are influential for the managerial decisions. However, no effect of optimism on

organizational performance is founded. The reason is that unrealistic optimism makes problem-solvers rely too much on the previous hypothesis and decide just based upon their existing experiences rather than the valid and rich information (Youssef & Luthans, 2007; Schneider, 2001). Hence, too optimistic problem-solvers are more likely to adopt IPS as Langabeer and DelliFraine (2011) find the positive association between optimism and incrementalism as opposed to a rational behavior for decision making. Additionally, we illustrate that when the three studied traits (hope, optimism and resiliency) are combined to form a higher-order construct of PPT, APS is more likely to be adopted. In other words, APS is more likely to be adopted as a favorable problem-solving behavior when CEOs are, at the same time, hopeful, optimistic, and resilient than when they present only one or two of these traits. These findings highlight how relevant is the point of view of CEOs, their perceptions and their positive emotions toward perceiving things (Peterson et al, 2009; Luthans & Youssef, 2007; Luthans et al., 2005). Additionally, the support we find for the idea that APS, defined as a behavioral attitude to logically approach and respond to the problems, ameliorates the organizational performance is in line with the paramount body of literature in strategic decision making (e.g. Goll & Rasheed, 1997; Dean & Sharfman, 1996; Priem et al., 1995). Hence, we define hope and resiliency as the psychological antecedents of APS in order to achieve organization success. Following the literature in strategic management, we also study various problem-specific characteristics (Elbanna & Child, 2007; Papadakis et al, 1998) and environment-specific setting (Child & Rodrigues, 2011; Mueller et al., 2007) to realize their effects on the problem-solving behavior of CEOs. Problem uncertainty, as well as environmental dynamism, could be influential on APS. In other words, when a problem is engaged with the high level of uncertainty, or even for the firms operating in a highly-turbulent and unstable external environment, APS is more likely to be adopted. In these conditions, APS at strategic level is

recommended for reducing both internal uncertainty (related to problems) and external one (related to external environment). Internal uncertainty could be minimized by the help of APS through gathering rich information regarding the problem structure, i.e. to understand what the problem exactly is, root-causes, and potential applicable solutions (Baer et al., 2013). APS, could be also interpreted as a formal planning for environmental scanning, for collecting reliable information from external actors, i.e. customers, suppliers, and competitors (Helfat & Peteraf, 2015; Lucy et al., 2005; Rindova, 1999). APS is not dependent upon age, education, tenure, and gender of respondents as demographic characteristics of CEOs are not significant. However, our findings suggest that CEOs in manufacturing firms find APS more useful for problem-solving, compared to their counterparts in service providers.

## **6.1 Theoretical Implication**

The first contribution of this study relates to the upper-echelon theory that emphasizes the role of senior executives and their personal characteristics on organization success. To our understanding, this study is the first attempt to scrutinize a less-investigated dimension of this theory which is positive psychological traits. According to our findings, we show a process (or behavior) through which positive psychological traits of CEOs contribute to the organizational performance. In other words, we suggest that the organizational performance depends on whether the psychological traits of CEOs enhance or inhibit analytical problem-solving of the CEOs.

Second, our study contributes to the body of knowledge in strategic management. APS is measured using a construct borrowed from the literature of psychology. This measure can be also adopted for strategic decision-making with rationality or comprehensiveness. We also show that, apart from institutional and firm-specific characteristics (e.g. firm infrastructure, resources, to name a few), problem-specific characteristics (i.e. problem importance and uncertainty), and

environmental situation (i.e. environmental dynamism and hostility), positivism in individual's attitudes matters in order to reap the full benefits of the rational decision-making.

Third, we also believe that this study has some theoretical implications for managerial cognitive capabilities and micro-foundations of dynamic capabilities proposed by Helfat and Peteraf (2015). In this study, adequate reasoning for problem-solving (i.e. APS) is introduced as a dynamic capability and we show that positive emotions and thoughts can shape top executives' perception toward seizing new opportunities and organization success accordingly.

Forth, Luthans et al. (2007a), based on the resource-based view theory, consider psychological traits as a newly-emerging human-based resource. In line with this study, we stress the importance of positive human traits to achieve sustainable competitive advantage.

Fifth, to our limited understanding, this study could be recognized as a successful attempt to link the micro perspective (i.e. individual's behavior) and the macro one (managerial decisions and actions for problem-solving) by investigating the psychological antecedents of the analytical CEOs.

Finally, while most of the behavioral studies focus on the U.S.-based samples, comparatively little attention is paid toward how individual's personality traits relate to firm-level performance across different cultures. This study is an attempt to change the research design and test the hypotheses in a culturally-diverse setting such as Iran.

## **6.2 Managerial Implication**

The managerial implications of this study for upper-echelon theory are straightforward. Our study confirms not only the importance of CEOs for organization success but also highlights positively-oriented human traits at the strategic level of the firm. One practical implication of this

study is to promote and place more attention on positive psychological traits and employ senior executives in particular CEOs with positive emotions for this strategic position. Even though we consider hope, optimism and resiliency as the established traits, prior literature suggests that they also can be developed by training interventions. However, according to our findings, better organizational performance, as a result of APS adoption, could be achieved when CEOs obtain the high level of hope, optimism, and resiliency all together. We attest that hope, optimism and resiliency could be recognized as the psychological antecedents for APS and managers might consider them as the emerging competitive advantage resources in order to get the most out of APS adoption. However, the findings of this study could be generalized or at least cautiously considered at shop-floor level since problem-solving behavior of front-line employees can be also affected by their emotions, attitudes, and mental strengths. Next, we also encourage APS (as opposed to IPS) for problem-solving and decision making and leaders may take it into consideration while confronting with the complex problems and decisions even when the external environment is extremely affected by changes and instability like our studied case, Iran.

## **7. Conclusion**

Our research, like any other attempts, is not exempt from limitations and therefore a couple of questions remain to be explored in future studies. First, for the organizational performance, we relied upon subjective measures due to confidentiality issues and the unwillingness of CEOs to release the financial information of the firm. Although we checked for the reliability of those subjective measures with the objective ones where possible, the number of observations where both measures are available was quite low (8 % approximately). So, future studies should put more emphasis on publicly-held firms where objective measures of the firm performance are easily available and transparent.

Second, our data includes cross-sectional observations and hence it is rather difficult to rule out the reverse causality. However, in the first part of the proposed theoretical framework (effects of hope, optimism, and resiliency on APS) reverse causality is not an issue. The reason is that we focused on positive traits that are stable over time. Unlike states that are alterable over time and vary across specific situations, people are born with these positive traits and hence, the connections from APS to hope, optimism, and resiliency are less likely to expect. This concern was carefully considered in the questionnaire when respondents were asked to assess themselves in terms of hope, optimism, and resiliency in general (trait) and not how they feel right now (state). However, one might claim that in the second part of the framework (effects of APS on firm performance) reverse causality could be an issue meaning that organization success might drive the firms toward having analytical problem-solvers as CEO. Although in this study more attention is placed in the first part the framework since the effectiveness of APS (positive impacts of APS on the firm performance and not the other way around) is already well-documented in the literature, future studies using longitudinal data would better highlight this concern and reduce the potentials for endogeneity problems.

Third, as our sample, we focus on Iran. This country, an interesting research setting though, makes the generalizability of the results difficult. To consider other countries, for example, whose people are known with more positive emotions would be also useful in this regard.

Forth, for the construct APS, we targeted mainly two followers to evaluate the way their leader (i.e. CEO) approach the problems. Although this strategy might be useful in order to reduce the response bias of CEOs, this way of assessment also might be influenced by close relationships between the followers and the CEO. Finally, duplicating this study for shop-floor, rather than strategic level, seems worthwhile to study. In this regard, researchers might be interested in

discussing the capability of problem-solvers (e.g. operation manager or shop-floor employees) while dealing with common problems at the shop-floor of the organizations and accordingly to investigate the effects of APS on operational performance of the firm.

## 8. References

- Achrol, R. S., & Stern, L. W. (1988). Environmental determinants of decision-making uncertainty in marketing channels. *Journal of Marketing Research*, 25(1), 36–50.
- Aguinis, H., Boyd, B. K., Pierce, C. A., & Short, J. C. (2011). Walking new avenues in management research methods and theories: Bridging micro and macro domains. *Journal of Management*, 37(2), 395–403.
- Argyris, C. (1976). Single-loop and double-loop models in research on decision making, 21(3), 363–375.
- Avey, J. B., Nimnicht, J. L., & Graber Pigeon, N. (2010). Two field studies examining the association between positive psychological capital and employee performance. *Leadership & Organization Development Journal*, 31(5), 384–401.
- Aydogmus, C., Camgoz, S. M., Ergeneli, A., & Ekmekci, O. T. (2018). Perceptions of transformational leadership and job satisfaction: The roles of personality traits and psychological empowerment. *Journal of Management and Organization*, 24(1), 81–107.
- Badri, M. A., Davis, D., & Davis, D. (2000). Operations strategy, environment uncertainty and performance: A path analytic model of industries in developing countries. *Omega*, 28(2), 155–173.
- Baer, M., Dirks, K., T., & Nickerson, J., A. (2013). Microfoundations of strategic problem formulation. *Strategic Management Journal*, 34, 197–214.
- Barrick, M. R., Mount, M. K., & Li, N. (2013). The theory of purposeful work behavior: The role of personality, job characteristics, and experienced meaningfulness. *Academy of Management*, 38(1), 1–51.
- Benis, A. R. (2014). The Impact of small and medium-sized enterprises on economic growth in Iran. *Global Journal of Management and Business Research*, 14(2), 1–6.
- Bharat Chandra, S., & Surendra Kumar, S. (2015). Psychological capital and organisational commitment: nature, structure and relationship in an Indian sample. *Asia-Pacific Journal of Management Research and Innovation*, 11(3), 230–244.
- Bliese, P. D. (1998). Group size, ICC values, and group-level correlations: A simulation. *Organizational Research Methods*, 1(4), 355–373.
- Block, J., & Kremen, A. M. (1996). IQ and ego-resiliency: Conceptual and empirical connections and separateness. *Journal of Personality and Social Psychology*, 70(2), 349–361.
- Brislin, R. W. (1980). Translation and content analysis of oral and written materials (In Triandi). *Boston: Allyn and Bacon: Handbook of cross-cultural psychology: Methodology*.
- Chaganti, R., & Sambharya, R. (1987). Strategic orientation and characteristics of upper management.

- Strategic Management Journal*, 8(4), 393–401.
- Child, J., & Rodrigues, S. B. (2011). How organizations engage with external complexity: A political action perspective. *Organization Studies*, 32(6), 803–824.
- Choo, A. S., Nag, R., & Xia, Y. (2015). The role of executive problem solving in knowledge accumulation and manufacturing improvements. *Journal of Operations Management*, 36, 63–74.
- Collins, J. C. (2001). Good to great : Why some companies make the leap... and others don't. *Random House*.
- Cowan, D. A. (1991). The effect of decision-making styles and contextual experience on executives' descriptions of organizational problem formulation. *Journal of Management Studies*, 28(5), 463–484.
- Dean, J. W., & Sharfman, M. P. (1993). Procedural rationality in the strategic decision-making process. *Journal of Management Studies*, 30(4), 587–610.
- Dean, J., W., & Sharfman, M., P. (1996). Does decision process matter? A study of strategic decision-making effectiveness. *Academy of Management Journal*, 39(2), 368–396.
- Dess, G., & Robinson, R. (1984). Measuring organizational performance in the absence of objective measures: The case of the privately-held firm and conglomerate business unit. *Strategic Management Journal*, 265–273.
- Dillman, D. A., Phelps, G., Tortora, R., Swift, K., Kohrell, J., Berck, J., & Messer, B. L. (2009). Response rate and measurement differences in mixed-mode surveys using mail, telephone, interactive voice response (IVR) and the Internet. *Social Science Research*, 38(1), 1–18.
- Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly*, 17(3), 313–327.
- Elbanna, S., & Child, J. (2007). The influence of decision, environmental and firm characteristics on the rationality of strategic decision-making. *Journal of Management Studies*, 44(4), 561–591.
- Ellspermann, S. J., Evans, G. W., & Basadur, M. (2006). The impact of training on the formulation of ill-structured problems. *Omega*, 35(2), 221–236.
- Espíritu-Olmos, R., & Sastre-Castillo, M. A. (2015). Personality traits versus work values: Comparing psychological theories on entrepreneurial intention. *Journal of Business Research*, 68, 1595–1598.
- Evans, J. S. B. T., & Stanovich, K. E. (2013). Dual-process theories of higher cognition: Advancing the debate. *Perspectives on Psychological Science*, 8(3), 223–241.
- Finkelstein, S., & Hambrick, D. C. (1990). Top-management-team tenure and organizational outcomes : The moderating role of managerial discretion. *Administrative Science Quarterly*, 35(3), 484–503.
- Fredrickson, B. L., & Joiner, T. (2002). Positive emotions trigger upward spirals toward emotional well-being. *Psychological Science*, 13(2), 172–175.
- Fredrickson, J. W. (1984). The comprehensiveness of strategic decision processes: Extension, observations, future directions. *Academy of Management Journal*, 27(3), 445–466.
- Fredrickson, J. W., & Iaquinto, A. L. (1989). Inertia and creeping rationality in strategic decision

- processes. *Academy of Management Journal*, 32(3), 516–542.
- Goll, I., & Rasheed, A. M. A. (1997). Rational decision-making and firm performance: The moderating role of environment. *Strategic Management Journal*, 18(7), 583–591.
- Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, 37(6), 504–528.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis (7<sup>th</sup> Edition)*. Upper saddle River, New Jersey: Pearson Education International.
- Halama, P. (2010). Hope as a mediator between personality traits and life satisfaction. *Studia Psychologica*, 52(4), 309–314.
- Hambrick, D. C. (2007). Upper echelons theory : An update. *Academy of Management Review*, 32(2), 334–343.
- Hambrick, D. C., & Mason, P. A. (1984). Upper Echelons: The organization as a reflection of its top managers. *Academy of Management Review*, 9(2), 193–206.
- Hart, S., & Banbury, C. (1994). How strategy-making processes can make a difference. *Strategic Management Journal*, 15, 251–269.
- Hart, S. L., & Quinn, R. E. (1993). Roles Executives Play: CEOs, behavioral complexity, and firm performance. *Human Relations*, 46(5), 543–574.
- Helfat, C. H., & Peteraf, M., A. (2015). Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strategic Management Journal*, 36(2), 831–850.
- Hitt, M. L., & Tyler, B. B. (1991). Strategic decision models: Integrating different perspectives. *Strategic Management Journal*, 12(5), 327–351.
- Hough, J. R., & White, M. A. (2003). Environmental dynamism and strategic decision-making rationality: An examination at the decision level. *Strategic Management Journal*, 24(5), 481–489.
- Huff, A. S., & Reger, R. K. (1987). Review of strategic process research. *Journal of Management*, 13(2), 211–236.
- Khandwalla, P. N. (1977). *The Design of Organizations*. Harcourt Brace Jovanovich, New York.
- Klockner, K. D., & Hicks, R. E. (2008). My next client: Understanding the Big Five and positive personality dispositions of those seeking psychosocial support interventions. *International Coaching Psychology Review*, 3(2), 148–163.
- Langabeer, J. R., & DelliFraine, J. (2011). Does CEO optimism affect strategic process? *Management Research Review*, 34(8), 857–868.
- Lucy, A. A., Richard, L. P., & Hermann Achidi, N. (2005). A CEO-adviser model of strategic decision making. *Journal of Management*, 31(5), 680.
- Luthans, F. (2002). Positive organizational behavior: Developing and managing psychological strengths. *Academy of Management Executive*, 16(1), 57–72.
- Luthans, F., Avolio, B. J., Walumbwa, F. O., & Li, W. (2005). The Psychological capital of Chinese workers : Exploring the relationship with performance. *Management and Organization Review*, 1(2),

249–271.

- Luthans, F., & Youssef, C. M. (2007). Emerging positive organizational behavior. *Journal of Management*, 33(3), 321–349.
- Luthans, F., Youssef, C. M., & Avolio, B. J. (2007). Psychological capital: Developing the human competitive edge. *Oxford University Press*.
- Mac Duffie, J. . (1997). The road to “rootcause”: Shop-floor problem solving at three auto assembly plants. *Management Science*, 43(4), 479–502.
- Mackey, A. (2008). The effect of CEOs on firm performance. *Strategic Management Journal*, 29, 315–334.
- Malhotra, N. K. (2006). Questionnaire design and scale development. *The handbook of marketing research: Uses, misuses, and future advances*.
- Mannor, M., J., Wowak, A., J., & Bartkus, V., O. (2016). Heavy lies the crown? How job anxiety affects top executive decisionmaking in gain and loss contexts. *Strategic Management Journal*, 37, 1968–1989.
- Masten, A. S. (2001). Ordinary magic, resiliency processes in development. *American Psychologist*, 56(3), 227–238.
- Maydeu-Olivares, A., & D’Zurilla, T. J. (1997a). The factor structure of the problem solving inventory. *European Journal of Psychological Assessment*, 13(3), 206–215.
- Maydeu-Olivares, A., & D’Zurilla, T. J. (1997b). The factor structure of the problem solving inventory. *European Journal of Psychological Assessment*, 13(3), 206–215.
- Miller, C. C. (2008). Decisional comprehensiveness and firm performance: Towards a more complete understanding. *Journal of Behavioral Decision Making*, 21, 598–620.
- Mintzberg, H., Raisinghani, D., & Theoret, A. (1976). The structure of “unstructured” decision processes. *Administrative Science Quarterly*, 21(2), 246–275.
- Molanezhad, M. (2010). A brief review of science and technology and SMEs development in I.R. Iran. *United Nations Conference on Trade and Development (UNCTD), Geneva*.
- Mueller, G. C., Mone, M. a., & Barker, V. L. (2007). Formal strategic analyses and organizational performance: decomposing the rational model. *Organization Studies*, 28(6), 853–883.
- Nadkarni, S., & Herrmann, P. O. L. (2010). CEO personality , strategic flexibility , and firm performance : The case of the Indian business process outsourcing industry, 53(5), 1050–1073.
- Nooraie, M. (2008). Decision magnitude of impact and strategic decision-making process output: the mediating impact of rationality of the decision-making process. *Management Decision*, 46(4), 640–655.
- Papadakis, V. M., Lioukas, S., & Chambers, D. (1998). Strategic decision making processes: The role of management and context. *Strategic Management Journal*, 19(1994), 115–147.
- Peterson, R. S., Smith, D. B., Martorana, P. V., & Owens, P. D. (2003). The impact of chief executive officer personality on top management team dynamics: One mechanism by which leadership affects

- organizational performance. *Journal of Applied Psychology*, 88(5), 795–808.
- Peterson, S. J., & Luthans, F. (2003). The positive impact and development of hopeful leaders. *Leadership & Organization Development Journal*, 24(1), 26–31.
- Peterson, S. J., Walumbwa, F. O., Byron, K., & Myrowitz, J. (2009). CEO positive psychological traits, transformational leadership, and firm performance in high-technology start-up and established firms. *Journal of Management*, 35(2), 348–368.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903.
- Priem, R. L., Rasheed, A., M., A., & Kotulic, A., G. (1995). Rationality in strategic decision processes, environmental dynamism and firm performance. *Journal of Management*, 21(5), 913–929.
- Quigley, T. J., & Graffin, S. D. (2017). Reaffirming the CEO effect is significant and much larger than chance: A comment on Fitza (2014). *Strategic Management Journal*, 38(3), 793–801.
- Quigley, T. J., & Hambrick, D. C. (2015). Has the “CEO effect” increased in recent decades? A new explanation for the great rise in America’s attention to corporate leaders. *Strategic Management Journal*, 36(2), 821–830.
- Ramaprasad, A., & Mitroff, I. I. (1984). On formulating strategic problems. *Academy of Management Review*, 9(4), 597.
- Repenning, N. P., & Sterman, J. D. (2002). Capability traps and self-confirming attribution errors in the dynamics of process improvement. *Administrative Science Quarterly*, 47(2), 265–295.
- Rindova, V. P. (1999). What corporate boards have to do with strategy: A cognitive perspective. *Journal of Management Studies*, 36(7), 953–975.
- Sapienza, H. J., Smith, K. G., & Gannon, M. J. (1988). Using subjective evaluations of organizational performance in small business research. *American Journal of Small Business*, 12(3), 45–53.
- Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: Assessment and implications of generalized outcome expectancies. *Health Psychology*, 4(3), 219–247.
- Schneider, S. L. (2001). In search of realistic optimism. *American Psychologist*, 56, 250–263.
- Schulman, P. (1999). Applying learned optimism to increase sales productivity. *Journal of Personal Selling & Sales Management*, XIX(1), 31–37.
- Schwenk, C. R. (1995). Strategic decision making. *Journal of Management*, 21(3), 471–493.
- Seligman, M. (2002). *Authentic happiness*. New York, Free Press.
- Smith, G. F. (1988). Towards a heuristic theory of problem structuring. *Management Science*, 34(12), 1489–1507.
- Smith, G. F. (1989). Defining managerial problems: A framework for prescriptive theorizing. *Management Science*, 35(8), 963–981.
- Snyder, C. R. (1995). Conceptualizing, measuring, and nurturing Hope. *Journal of Counseling & Development*.

- Snyder, C. R., Harris, C., Anderson, J. R., Holleran, S. A., Irving, L. M., Sigmon, S. T., ... Harney, P. (1991). The will and the ways: Development and validation of an individual-differences measure of hope. *Journal of Personality and Social Psychology*, *60*, 570–585.
- Snyder, C. R., Sympson, S. C., Ybasco, F. C., Borders, T. F., Babyak, M. A., & Higgins, R. L. (1996). Development and validation of the State Hope Scale. *Journal of Personality and Social Psychology*, *70*(2), 321–335.
- Snyder, C. R. (2000). The Past and Possible Futures of Hope. *Journal of Social and Clinical Psychology*, *19*(1), 11–28.
- Tang, Y., Mack, D. Z., & Chen, G. (2017). The differential effects of CEO narcissism and hubris on corporate social responsibility. *Strategic Management Journal*, *39*(5), 1370–1387.
- Therasa, C., & Vijayabanu, C. (2015). The impact of Big Five Personality traits and positive psychological strengths towards job satisfaction: A review. *Periodica Polytechnica Social and Management Sciences*, *23*(2), 142–150.
- Tichy, N., & Cohen, E. (1997). *The leadership engine: How winning companies build leaders at every level* (HarperColl). HarperCollins: New York.
- Tucker, A. L., Edmondson, A. C., & Spear, S. (2002). When problem solving prevents organizational learning. *Journal of Organizational Change Management*, *15*(2), 122–137.
- Tugade, M., and Fredrickson, B. L. (2004). Resilient individuals use positive emotions to bounce back from negative emotional experiences. *Journal of Personality and Social Psychology*, *86*, 320–333.
- United Nations Industrial Development Organization. (2003). *To enhance the contribution of an efficient and competitive small and medium-sized enterprise sector. To industrial and economic development in the Islamic republic of Iran.*
- Volkema, R. J. (1986). Problem formulation as a purposive activity. *Strategic Management Journal*, *7*, 267–279.
- von Hippel, E., & von Krogh, G. (2016). Identifying viable“ need-solution pairs”: Problem solving without problem formulation. *Organization Science*, *27*(1), 207–221.
- Waldman, D. A., Ramírez, G. G., House, R. J., & Puranam, P. (2001). Does leadership matter ? CEO leadership attributes and profitability under conditions of perceived environmental uncertainty. *Academy of Management Journal*, *44*(1), 134–143.
- Wiersema, M. F., & Bantel, K. A. (1992). Top management team demography and corporate strategic change. *The Academy of Management Journal*, *35*(1), 91–121.
- Youssef, C. M., & Luthans, F. (2007). Positive organizational behavior in the workplace: The impact of hope, optimism, and resilience. *Journal of Management*, *33*(5), 774–800.
- Zweig, D., & Webster, J. (2004). What are we measuring? An examination of the relationships between the big-five personality traits, goal orientation, and performance intentions. *Personality and Individuals Differences*, *36*, 1693–1708.

## Appendix

Variables and measures employed in the study are listed as below:

Variable	Measured Items	Variables Derived From	No. of Items
<p><b>Perceived Firm Performance</b></p>	<p><b>(a) <u>Financial and Business Performance</u></b></p> <ol style="list-style-type: none"> <li>1. Return on assets (ROA) over the last 3 years compared to your competitors</li> <li>2. Operating Profits over the last 3 years compared to your competitors</li> <li>3. Market share over the last 3 years compared to your competitors</li> <li>4. Growth rate of sales (or revenues) over the last 3 years compared to your competitors</li> <li>5. New product development over the last 3 years compared to your competitors</li> <li>6. Diversification into new business over the last 3 years compared to your competitors</li> </ol> <p><b>(b) <u>Organizational Effectiveness</u></b></p> <ol style="list-style-type: none"> <li>7. Quality of product (or service) over the last 3 years compared to your competitors</li> <li>8. Employee satisfaction over the last 3 years compared to your competitors</li> <li>9. Efficiency of Operation over the last 3 years compared to your competitors</li> <li>10. Social responsibilities over the last 3 years compared to your competitors</li> </ol>	<p>Elbanna and Child (2007); Hart and Banbury (1994)</p>	<p>10</p>

<b>Variable</b>	<b>Measured Items</b>	<b>Variables Derived From</b>	<b>No. of Items</b>
<b>Hope</b>	<ol style="list-style-type: none"> <li>1. I can think of many ways to get out of a jam (Pathways Subscale)</li> <li>2. I energetically pursue my goals (Agency Subscale)</li> <li>3. I feel tired most of the time</li> <li>4. There are lots of ways around any problem (Pathways Subscale)</li> <li>5. I am easily downed in an argument</li> <li>6. I can think of many ways to get the things in life that are most important to me (Pathways Subscale)</li> <li>7. I worry about my health</li> <li>8. Even when others get discouraged, I know I can find a way to solve the problem (Pathways Subscale)</li> <li>9. My past experiences have prepared me for the future (Agency Subscale)</li> <li>10. I've been pretty successful in life (Agency Subscale)</li> <li>11. I usually find myself worrying about something</li> <li>12. I meet the goals that I set for myself</li> </ol>	Snyder et al. (1991)	12

<b>Variable</b>	<b>Measured Items</b>	<b>Variables Derived From</b>	<b>No. of Items</b>
<b>Optimism</b>	<ol style="list-style-type: none"> <li>1. In uncertain times, I usually expect the best</li> <li>2. It is easy for me to relax</li> <li>3. If something can go wrong for me, it will</li> <li>4. I am always optimistic about my future</li> <li>5. I enjoy my friends a lot</li> <li>6. It's important for me to keep busy</li> <li>7. I hardly ever expect things to go my way</li> <li>8. I don't get upset too easily</li> <li>9. I rarely count on good things happening to me</li> <li>10. Overall, I expect more good things to happen than bad</li> </ol>	Scheier and Carver (1985)	10

Variable	Measured Items	Variables Derived From	No. of Items
<b>Resiliency</b>	<ol style="list-style-type: none"> <li>1. I am generous with my friends</li> <li>2. I quickly get over and recover from being startled</li> <li>3. I enjoy dealing with new and unusual situations</li> <li>4. I usually succeed in making a favorable impression on people</li> <li>5. I enjoy trying new foods I have never tasted before</li> <li>6. I am regarded as a very energetic person</li> <li>7. I like to take different paths to familiar places</li> <li>8. I am more curious than most people</li> <li>9. Most of the people I meet are likable</li> <li>10. I usually think carefully about something before acting</li> <li>11. I like to do new and difficult things</li> <li>12. My daily life is full of things that keep me interested</li> <li>13. I would be willing to describe myself as a pretty “strong” personality</li> <li>14. I get over my anger at someone reasonably quickly</li> </ol>	Block and Kremen (1996)	14

Variable	Measured Items	Variables Derived From	No. of Items
<b>APS Behavior</b>	<ol style="list-style-type: none"> <li>1. When a solution to a problem was unsuccessful, I do not examine why it didn't work.</li> <li>2. After I have tried to solve a problem with a certain course of action, I take time and compare the actual outcome to what I thought should have happened.</li> <li>3. When I have a problem, I think up as many possible ways to handle it as I can until I can't come up with any more ideas.</li> <li>4. When deciding on an idea or possible solution to a problem, I do not take time to consider the chances of each alternative being successful.</li> <li>5. When confronted with a problem, I stop and think about it before deciding on a next step.</li> <li>6. When making a decision, I weigh the consequences of each alternative and compare them against each other.</li> <li>7. I try to predict the overall result of carrying out a particular course of action.</li> <li>8. When I try to think of ways of handling a problem, I do not try to combine different ideas together</li> <li>9. When I am confused by a problem, one of the first things I do is survey the situation and consider all the relevant pieces of information.</li> </ol>	Maydeu-Olivares and D'Zurilla (1997)	9

Variable	Measured Items	Variables Derived From	No. of Items
<b>Problem-Specific Characteristics</b>	<b>(a) <u>Problem Importance</u></b> <ol style="list-style-type: none"> <li>1. To set parameters for subsequent problems</li> <li>2. Seriousness of consequences if something went wrong</li> <li>3. Seriousness of delaying the problem</li> <li>4. Decision importance</li> <li>5. Time Pressure</li> </ol>	Elbanna and Child (2007)	5
	<b>(b) <u>Problem Uncertainty</u></b> <ol style="list-style-type: none"> <li>1. Clarity of kind of information to be collected</li> <li>2. Uncertainty about the actions to be taken</li> <li>3. Difficulty of predicting the outcomes</li> </ol>	Elbanna and Child (2007)	3

Variable	Measured Items	Variables Derived From	No. of Items
Environment -Specific Characteristics	<p><b>(a) <u>Environmental Dynamism</u></b></p> <p><b><u>(a.1) Dynamism in Marketing Practices</u></b></p> <ol style="list-style-type: none"> <li>Changes in mix of products carried</li> <li>Changes in sales strategies</li> <li>Changes in sales promotions/ advertising strategies</li> </ol> <p><b><u>(a.2) Competitor Dynamism</u></b></p> <ol style="list-style-type: none"> <li>Changes in competitor's mix of products</li> <li>Changes in competitor's sales strategies</li> <li>Changes in competitor's sales promotions/ advertising strategies</li> </ol> <p><b><u>(a.3) Customer Dynamism</u></b></p> <ol style="list-style-type: none"> <li>Changes in customer preferences in product features</li> <li>Changes in customer preferences in brand</li> <li>Changes in customer preferences in product quality/price</li> </ol>	Achrol and Stern (1988)	9
	<p><b>(b) <u>Environmental Hostility</u></b></p> <ol style="list-style-type: none"> <li>Riskiness</li> <li>Stressfulness</li> <li>Dominance over the firm</li> </ol>	Khandwalla (1977)	3

Variable	Measured Items	Variables Derived From	No. of Items
CEO's Demographic Characteristics	<p><b>(a) <u>CEO's Level of Education</u></b></p> <p>One five-point scale measuring CEO's level of education (1= high school, 2= college, 3= bachelor, 4= master, 5= PhD)</p>	Drawn from upper-echelon theory by Hambrick and Mason (1984)	1
	<p><b>(b) <u>CEO's Number of Years in the Position (Tenure)</u></b></p> <p>A continuous variable measuring the number of years the CEO is with the company</p>		1
	<p><b>(c) <u>CEO's Age</u></b></p> <p>A continuous variable measuring CEO's age</p>		1
	<p><b>(d) <u>CEO's Gender</u></b></p> <p>A dummy variable (1= male, 0= female)</p>		1

<b>Variable</b>	<b>Measured Items</b>	<b>Variables Derived From</b>	<b>No. of Items</b>
<b>Firm Size</b>	A continuous variable measuring the number of employees	Hitt and Tyler (1991); Fredrickson and Iaquinto (1989)	1

<b>Variable</b>	<b>Measured Items</b>	<b>Variables Derived From</b>	<b>No. of Items</b>
<b>Big 5 Personality Traits</b>	<ol style="list-style-type: none"> <li>1. Extraverted, enthusiastic</li> <li>2. Critical, quarrelsome</li> <li>3. Dependent, self-disciplined</li> <li>4. Anxious, easily upset</li> <li>5. Open to new experiences</li> <li>6. Reversed, quite</li> <li>7. Sympathetic, warm</li> <li>8. Disorganized, careless</li> <li>9. Calm, emotionally stable</li> <li>10. Conventional, uncreative</li> </ol>	Gosling et al. 2003	10

## Thesis Conclusion

This dissertation consists primarily of three independent papers for managerial and operational problem-solving. From a cognitive perspective two different behavioral attitudes of individuals are investigated while approaching and responding to the problems at different levels of the organizations (shop-floor and strategic level). One is introduced as intuitive problem-solving (IPS) as it usually comes instinctively. Intuitive problem-solvers jump to the solution by implementing the first idea that comes to their mind. As a matter of fact, IPS is characterized by skipping or abbreviating the steps of a logical behavior. The second mode rests on analytical reasoning on individuals, called analytical problem-solving (APS). Analytical problem-solvers are required to go through a very structured platform for the comprehensive problem-formulation (i.e. problem definition, problem analysis, and solution design) before the final decision is reached. Given these distinct behavior modes, problem-solving literature promotes APS as a superior one for solving the problems fundamentally with less probability of recur, contributing to the strategic capabilities in particular organizational learning and continuous improvement, and eventually improving the long-term performance of the firm.

In the first paper, APS supporting factors and the enabling condition through which this superior behavior mode pays off successfully are discussed and summarized in three groups of (1) organizational, (2) environmental, and (3) problem nature related factors. All in all, it is argued that for both problem formulation and strategic decision making, at both shop-floor and upper-management levels, a set of *organizational antecedents* (i.e. time availability, organizational resources access, managerial awareness, collaborative culture, and learning infrastructure) is required to successfully cope with *ill-structured problems* (i.e. strategic decisions or complex problems). Also, in *high environmental dynamism*, APS could be recommended to reduce the

external uncertainty (related to sudden changes of customers' requirements, intense competition, and high technological development) perceived by the organization.

Second paper place the attention just on operational problems following two aims. Motivated by a field-work at a manufacturing firm, the first objective is to explore the theory-based micro-foundations of both IPS and APS as potential behaviors. The second aim is to highlight “*IPS dominance*” (i.e. higher tendency to adopt IPS despite the effectiveness of APS) and discover the major reasons of this phenomenon, in the context of operational problem-solving. Based on the system dynamics modeling and simulation results, three major reasons are identified that cause IPS to take precedence over APS: (1) problem urgency as a consequence of time pressure, (2) managers with short-term horizon who prefer immediate success rather than sustainable succeed, and finally (3) insufficient attention to establish and maintain APS organizational antecedents (e.g. organizational resource, collaborative culture).

In the third paper, the focus is switched from the operational level to the strategic one. In other words, APS is emphasized but at the upper-management level for the managerial problem-solving. APS as a potential behavior mode, like any other behaviors, is subject to the psychology of individuals or the way problem-solvers perceive things. So, it is claimed that psychological traits of individuals tend to shape top executive's behavior in particular the strategic actions of the CEO. This paper examines the effectiveness of APS and considers it as a mechanism through which positive psychological traits of the CEO (i.e. hope, optimism and resiliency) contribute to the firm-level performance. Empirical results using a structural equation modeling on 373 observations (from CEOs and followers) in Iran reveal that hope and resiliency have positive effects on APS of the CEOs and thus introduced as the psychological antecedents of this behavior mode necessary to achieve the high performance of the firm. Also, it is concluded that combining all three positive

traits to form a higher-order construct known as positive psychological traits (PPT) is more influential on APS rather than having hope, optimism and resiliency taken in isolation.

In this work, different theories deeply rooted in other research streams, are employed to study problem-solving behavior of individuals. For instance, a well-known perspective in organizational studies (i.e. organizational learning) is adopted for the second chapter, to unpack IPS and APS as potential behavior modes to overcome the problems. In the third paper, also, emphasizing APS as a superior mode for sustainable success, variables are borrowed from psychology (i.e. personality traits) and coupled with APS to investigate the psychological antecedents of this behavior mode, at strategic level of the firm. This attitude provides the opportunity of bridging the gap between different management streams such as organizational behavior, strategic management, and operations management since I deeply believe in interdisciplinary areas as the upcoming trends in management studies.

Note that the theoretical and managerial contributions of each paper are discussed separately at the end of the papers.