

**UNIVERSIDADE NOVE DE JULHO
PROGRAMA DE PÓS-GRADUAÇÃO EM GESTÃO DE PROJETOS – PPGP
DOUTORADO PROFISSIONAL EM ADMINISTRAÇÃO**

**A FRAMEWORK TO SUPPORT VALUE CONSTRUCTION BASED ON SHARED
MENTAL MODELS' THEORY CONSIDERING THE GAP OF STAKEHOLDERS'
PERCEPTIONS OF VALUE REALIZATION**

RICARDO LUIS ZANFELICCE

São Paulo

2022

Ricardo Luis Zanfelicce

**A FRAMEWORK TO SUPPORT VALUE CONSTRUCTION BASED ON SHARED
MENTAL MODELS' THEORY CONSIDERING THE GAP OF STAKEHOLDERS'
PERCEPTIONS OF VALUE REALIZATION**

**UM MODELO BASEADO NA TEORIA DE MODELOS MENTAIS
COMPARTILHADOS PARA SUPORTAR A CONSTRUÇÃO DE VALOR
CONSIDERANDO AS DIFERENÇAS DE PERCEPÇÃO DAS PARTES
INTERESSADAS DO VALOR REALIZADO**

Tese apresentada ao Programa de Pós-Graduação em Gestão de Projetos da Universidade Nove de Julho – UNINOVE, Doutorado Profissional em Administração, como requisito parcial para obtenção do grau de **Doutor em Administração**.

Orientador: Prof. Dr. Flávio Santino Bizarrias

São Paulo

2022

Zanfelicce, Ricardo Luis.

A framework to support value construction based on shared mental models' theory considering the gap of stakeholders' perceptions of value realization. / Ricardo Luis Zanfelicce. 2022.

141 f.

Tese (Doutorado) - Universidade Nove de Julho - UNINOVE, São Paulo, 2022.

Orientador (a): Prof. Dr. Flávio Santino Bizarrias.

1. Value construction. 2. Stakeholder's perception. 3. Mental models' theory. 4. Project management. 5. Value-centric paradigm.

I. Bizarrias, Flávio Santino. II. Título.

CDU 658.012.2



Ricardo Luis Zanfelicce

**A FRAMEWORK TO SUPPORT VALUE CONSTRUCTION BASED ON SHARED
MENTAL MODELS' THEORY CONSIDERING THE GAP OF STAKEHOLDERS'
PERCEPTIONS OF VALUE REALIZATION**

Tese apresentada ao Programa de Pós-Graduação em Gestão de Projetos da Universidade Nove de Julho – UNINOVE, Doutorado Profissional em Administração, como requisito parcial para obtenção do grau de **Doutor em Administração**.

Orientador: prof. Dr. Flávio Santino Bizarrias

São Paulo, 16 de dezembro de 2022.

A handwritten signature in blue ink, appearing to read "Flávio Santino Bizarrias".

Presidente: Prof. Dr. Flávio Santino Bizarrias - Orientador

A handwritten signature in blue ink, appearing to read "Roberto Lima Ruas".

Membro: Prof. Dr. Roberto Lima Ruas (UNINOVE)

A handwritten signature in blue ink, appearing to read "Walter C. Satyro".

Membro: Prof. Dr. Walter Cardoso Satyro (UNINOVE)

A handwritten signature in blue ink, appearing to read "Mauro Luiz Martens".

Membro: Prof. Dr. Mauro Luiz Martens (UNIP)

A handwritten signature in blue ink, appearing to read "Ivano Ribeiro".

Membro: Prof. Dr. Ivano Ribeiro (UNIOESTE)

Dedico este trabalho à minha esposa Teresa e às minhas filhas Giovana e Gabriela

AGRADECIMENTO

Chegar aqui tem um sabor muito especial. O doutorado não era um objetivo até alguns anos atrás, tampouco um sonho. Na verdade, eu não imaginava que isso seria possível um dia. Então, acho que é muito importante deixar aqui registrado os meus agradecimentos às pessoas que contribuíram para que eu pudesse estar hoje aqui escrevendo estas últimas palavras da tese.

Em primeiro lugar, agradeço (todos os dias) ao Papai do Céu por me dar saúde e proporcionar as condições necessárias para que eu pudesse me dedicar aos estudos.

Agradeço à minha mãe, Tereza, que me ensinou a “ser gente” e que lutou muito para que eu alcançasse a primeira graduação, completando os primeiros degraus dessa escalada.

Agradeço principalmente à minha esposa, Teresa, que muito me ajudou e proporcionou toda a retaguarda para que eu pudesse me dedicar o tempo necessário para elaborar este documento. Mais do que isso, me deu todo o apoio emocional e sentimental, sem nunca cobrar nada. E todo esse apoio já vem de mais de 30 anos de convivência. Muito obrigado, Tê!

Agradeço às minhas filhas, Giovana e Gabriela, que tiveram que abrir mão de momentos em família para que eu pudesse fazer as leituras e pesquisas necessárias. Vamos recuperar esse tempo agora, meninas!

Agradeço muito ao Prof. Dr. Flávio Santino Bizarrias, meu orientador, por confiar em mim. Mais do que isso, por me dar todo o apoio e mostrar os caminhos para concluir as pesquisas e a tese. Foram muitas conversas à noite e aos finais de semana. Prof., ao final desses 3 anos, posso dizer, de minha parte, que construímos uma relação muito maior do que orientador e orientando. Acho que o Sr. também compartilha desse sentimento. Muito obrigado por tudo! Continuamos a trabalhar nos artigos daqui em diante!

Agradeço aos professores que participaram das bancas pelas valiosas contribuições para a tese e para os artigos que ainda serão submetidos. Prof. Dr. Renato Penha, Prof. Dr. Roberto Lima Ruas, Prof. Dr. Walter Cardoso Satyro, Prof. Dr. Mauro Luiz Martens e Prof. Dr. Ivano Ribeiro. Foi um grande prazer ouvir seus comentários, críticas e sugestões.

Finalmente deixo registrado meus agradecimentos aos demais professores do programa do PPGP, mas em especial à Profª. Dra. Cristina Dai Prá Martens pelas valiosas discussões realizadas na disciplina de Seminário de Tese, fundamentais para a estruturação desta tese.

ABSTRACT

Projects are ordinarily executed to create economic value and competitive advantage to organizations. Thus, project management have a strategic function, while must constantly adapt to business changes. The Service Dominant Logic paradigm has emerged in marketing, proposing that the creation and cocreation of value replaces the value embedded in tangible resources. Thus, value is no more delivered through single transactions operations, but is realized through the use of tangible resources based on longer relationships with customers. The project management has adapted to this change, replacing the product by the value in the center of the projects. As value is hardly measurable because can assume tangible and intangible perspectives, each stakeholder perceives the value creation differently during the project execution. The value realized by the project's outcome is percept differently by multiple stakeholders as well. These particular perceptions of the value are grounded on stakeholder's individual mental models, which are characteristic of the humans' cognitive process. Hence, this thesis adopted the mental model's theory to explain how multiple stakeholders recognize the value realized by the project's outcome based on a project success scale. Adaptive methodology tends to reduce these perception gaps promoting a common understanding of the project objectives among main stakeholders. However, adaptive methodology is not suitable to all kinds of projects, consequently a plan-driven approach must be adopted in some cases. As plan-driven approaches normally tend to keep the customer away during the project execution, agile practices are introduced in a hybrid configuration, trying to bring the customer closer to the project and reduce the gap of value perceptions among multiple stakeholders. However, agile practices are erratically and subjectively adopted, normally resulting in failures. Thus, a framework is proposed by this thesis aiming to support the project managers to choose the most suitable agile practices, according to the contingencies involved in the context of each project. The shared mental model's theory is the ground of the proposed framework.

Key words: Value construction; Stakeholder's perception; Mental models' theory; Project management; value-centric paradigm

RESUMO

Os projetos são normalmente executados para criar valor econômico e vantagem competitiva para as organizações. Assim, o gerenciamento de projetos tem uma função estratégica, ao mesmo tempo que precisa se adaptar constantemente às mudanças do mercado. O paradigma da Lógica do Serviço Dominante emergiu no marketing, propondo que a criação e cocriação de valor substituísse o valor embutido em produtos físicos. Assim, o valor não é mais entregue através de operações puramente transacionais, mas é realizado através do uso de recursos tangíveis, baseado em relacionamentos mais duradouros com os clientes. A gestão de projetos adaptou-se a esta mudança substituindo o produto pelo valor no centro dos projetos. Como o dificilmente consegue-se mensurar valor objetivamente, uma vez que o valor pode assumir perspectivas tangíveis e intangíveis, cada parte interessada percebe a criação de valor durante a execução do projeto de forma diferente. Da mesma forma, o valor realizado pelo resultado do projeto também é percebido de forma diferente pelas várias partes interessadas. Essas percepções particulares do valor realizado são fundamentadas em modelos mentais individuais, que são característicos do processo cognitivo dos seres humanos. Assim, esta tese adotou a teoria de modelos mentais para explicar como as várias partes interessadas reconhecem o valor realizado pelo resultado do projeto com base em uma escala de sucesso do projeto. A metodologia adaptativa tende a reduzir as diferenças de percepção, promovendo um entendimento comum dos objetivos do projeto entre as principais partes interessadas. No entanto, a metodologia adaptativa não é adequada para todos os tipos de projetos, obrigando a escolha por uma abordagem orientada pelo plano em alguns casos. Como as abordagens orientadas pelo plano normalmente tendem a manter o cliente afastado durante a execução do projeto, as práticas ágeis são introduzidas em uma configuração híbrida, tentando aproximar o cliente e reduzir a distância do valor percebido pelas diferentes partes interessadas. No entanto, as práticas ágeis são normalmente adotadas de forma errática e subjetiva, resultando em falhas. Portanto, um *framework* é proposto por esta tese com o objetivo de auxiliar os gerentes de projeto a escolher as práticas ágeis mais adequadas, de acordo com as contingências envolvidas no contexto do projeto. A teoria de modelos mentais compartilhados é a base do modelo apresentado.

Palavras-chave: Construção de valor; Percepção das partes interessadas; Teoria dos modelos mentais; Gestão de projetos; Paradigma do valor centrado

LIST OF ABBREVIATIONS

IS – Information Systems

NPD - New Products Development

SD – Standard Deviation

SD-L – Service Dominant Logic

SP_BS – Business and direct success

SP_IC – Impact on customer

SP_IT - Impact on team

SP_PE – Project efficiency

SP_PF – Preparation for the future

TABLES INDEX

<i>Table 1 - Citation analysis</i>	58
<i>Table 2 - Clusters</i>	60
<i>Table 3 - Reliability analysis</i>	61
<i>Table 4 - Single dependent variables</i>	82
<i>Table 5 - Experience of the respondents</i>	84
<i>Table 6 - Educational level</i>	84
<i>Table 7 - Economic sector</i>	84
<i>Table 8 - Contract type</i>	85
<i>Table 9 - Relevance to the result of the project</i>	85
<i>Table 10 - Readiness of the scope in the project start</i>	85
<i>Table 11 - Readiness of the schedule in the project start</i>	86
<i>Table 12 - Time after project closure</i>	87
<i>Table 13 - Sample descriptive statistic</i>	89
<i>Table 14 - Perception of general value realized - post-Hoc tests</i>	89
<i>Table 15 - Dependent variables based on project success scale</i>	90
<i>Table 16 - Descriptive statistics of the groups</i>	90
<i>Table 17 - ANOVA results</i>	91
<i>Table 18 - Perception of general value realized - post-Hoc tests</i>	91
<i>Table 19 - ANOVA - Experience in project management</i>	94
<i>Table 20 - ANOVA - Experience as project manager</i>	94

FIGURES INDEX

<i>Figure 1 - Methodological matrix</i>	31
<i>Figure 2 - Research design of the thesis made through sequential studies</i>	32
<i>Figure 3 - Technological product assessment</i>	38
<i>Figure 4 - Research flow</i>	55
<i>Figure 5 - Search string used in Web of Science and Scopus</i>	56
<i>Figure 6 - Age of the respondents</i>	83
<i>Figure 7 - Level of hybridism</i>	86
<i>Figure 8 - Classification of the stakeholders' groups according to Davis (2014)</i>	87
<i>Figure 9 - Classification of the stakeholders' groups according to stakeholder profile</i>	88
<i>Figure 10 - Value management based on mental models' theory</i>	114
<i>Figure 11 - Value gap reduction region</i>	118

SUMMARY

TABLES INDEX	X
FIGURES INDEX	XI
1 INTRODUCTION	16
1.1. RESEARCH PROBLEM	19
1.2. OBJECTIVES.....	21
1.3. JUSTIFICATION	22
1.4. THEORETICAL BACKGROUND	24
1.4.1 Value delivery	24
1.4.2 Stakeholder’s perception gap of value realization	26
1.4.3 Mental models’ theory.....	27
1.4.4 Shared Mental models’ theory	29
1.5. STRUCTURE OF THE THESIS	30
2 METHODOLOGICAL PROCEDURES	31
2.1. RESEARCH DESIGN.....	31
2.2. STUDY 1 - A BIBLIOMETRIC STUDY ABOUT VALUE DELIVERY IN PROJECTS ENVIRONMENT.....	32
2.3. STUDY 2 - UNDERSTANDING THE STAKEHOLDER’S DIFFERENT PERCEPTIONS OF VALUE REALIZATION BY PROJECTS THROUGH THE MENTAL MODELS THEORY	33
2.4. STUDY 3 - A THEORETICAL FRAMEWORK TO SUPPORT VALUE CONSTRUCTION BY PROJECTS BASED ON STAKEHOLDERS’ PERCEPTIONS AND MENTAL MODELS’ THEORY	35
3 TECHNOLOGICAL PRODUCT	36
4 CONCLUSION AND CONTRIBUTIONS	38
REFERENCES	41

APENDIX A	51
1. INTRODUCTION	52
2. RESEARCH METHOD	55
3. RESULTS	56
3.1. CITATION	57
3.2. CO-CITATION	58
3.3. EXPLORATORY FACTOR ANALYSIS (EFA)	59
3.3.1 FACTOR 1: FRONT-END OF NEW PRODUCTS DEVELOPMENT PROJECTS (NPD)	61
3.3.2. FACTOR 2: VALUE MANAGEMENT	62
3.3.3. FACTOR 3: ECONOMIC VIABILITY IN LARGE PROJECTS	62
3.3.4. FACTOR 4: PROJECT MANAGEMENT APPROACHES	63
3.3.5. FACTOR 5: METHODOLOGICAL APPROACH IN PROJECT MANAGEMENT RESEARCH	63
4. DISCUSSION	64
5. CONCLUSIONS	65
REFERENCES	67
APENDIX B	72
1. INTRODUCTION	73
2. THEORETICAL BACKGROUND	75
2.1. STAKEHOLDER’S PERCEPTION GAP OF VALUE REALIZED	75
2.2. MENTAL MODELS’ THEORY	78
3. RESEARCH METHOD	80
3.1. ANOVA	80
4. DATA ANALYSIS	81

4.1. VARIABLES DECLARATION	81
4.2. RESPONDENTS' BACKGROUND AND PROJECTS' CHARACTERISTICS.....	83
5. RESULTS.....	87
5.1. PERCEPTION OF GENERAL VALUE REALIZED	88
5.2. PERCEPTION OF VALUE REALIZATION IN EACH DIMENSION OF PROJECT	
SUCCESS.....	89
6. DISCUSSION.....	92
7. CONCLUSION	96
8. LIMITATIONS, CONTRIBUTIONS, AND FURTHER STUDIES	97
REFERENCES	98
APENDIX C	104
1. INTRODUCTION	105
2. THEORETICAL BACKGROUND	108
2.1. CHANGING TO THE NEW PARADIGM OF VALUE CENTRIC.....	108
2.2. UNDERSTANDING OUTPUT, OUTCOME, SUCCESS, BENEFITS, AND	
VALUE.....	109
2.3. STAKEHOLDER'S PERCEPTION GAPS	110
2.4. MENTAL MODELS AND SHARED MENTAL MODELS IN PROJECT	
MANAGEMENT	111
3. FRAMEWORK DESCRIPTION.....	114
3.1. VALUE MANAGEMENT BASED ON MENTAL MODEL AND SHARED MENTAL	
MODEL'S THEORY	114
3.2. VALUE GAP REDUCTION ZONE.....	117
4. DISCUSSION.....	119
5. CONCLUSION, LIMITATIONS, AND CONTRIBUTIONS.....	122

REFERENCES 124

APENDIX D 131

1 INTRODUCTION

Projects are recognized as powerful weapons to create economic value and competitive advantage, contributing to corporate strategy. Traditionally, projects are seen as temporary organizations to do the necessary work to deliver beneficial changes (Turner, 2009). Projects have also been recognized as execution vehicles with a clear distinction between strategic decisions and operational business (Brookes et al., 2017). Without projects organizations would become obsolete, irrelevant, and unable to cope with competitive business environment (Shenhar et al., 2001).

Despite these statements about projects are still valid, the focus of the projects has changed from product dominance towards value predominance, following a changing movement started in the marketing. The latest project-related research has broadened the view of projects and project-based operations considering them vehicles for defining, creating, and delivering value (Laursen & Svejvig, 2016).

Vandermerwe and Rada (1988) introduced the term “servitization of business”, according to which corporations should add value to their core corporate offerings through “bundles of customer-focused combinations of goods, services, support, self-service, and knowledge” (p.316). The servitization changed the emphasis of the market from single transaction to lasting relationship, where selling physical products lost importance when compared to services realization, moving from the dominance of the products towards the dominance of service (Vargo & Lusch, 2004).

The replacement of products by services originated a new dominant logic in marketing denominated Service Dominant Logic (SD-L) (Vargo & Lusch, 2004), where the long-term partnership is prioritized over a single transactional relationship between supplier and customer. Consequently, an initially proposed value is transformed in value-in-use (Grönroos & Gummerus 2014), replacing the concept of value-in-exchange present in the single transactional relationship. The SD-L is grounded on the individual perception of benefits that can be generated (Vargo & Lusch, 2004) by the services and more lasting partnerships.

Project management must adapt to the paradigm of SD-L. According to Winter and Szczepanek (2008), project management approach should change its focus towards value and benefits delivery to organizations, building a stronger strategic approach. The concern with the capital asset has been gradually replaced by the challenge of implementing the business strategy, improving organizational effectiveness, and managing the stakeholders’ benefits (Winter & Szczepanek, 2008).

Consequently, the emphasis goes towards a more strategic project management approach, increasing the integration between projects and business strategy (Morris & Jamieson, 2004; Brady et al., 2005; Levine, 2005; Ward, 2005). Supplier and client organizations need to review their business models, creating value for all relevant stakeholders of a project (Laurson & Svejvig 2016). A project management approach giving more emphasis on value and benefits delivery is in harmony with project success concept proposed by Shenhar et al. (2001) and Shenhar and Dvir (2007). According to this project success concept, the project management assumes a strategic role and must pursue a better alignment between project efforts and the short- and long-term goals of the organization.

Looking from this strategic and integrated perspective, delivering the outcome as specified, on time, and increasing value delivery to shareholders is no longer enough to consider a project successful, as previously already predicted by Cohen and Graham (2001). The recommendation is to replace the product (product-centric) by the value (value-centric) as the project's focus, emphasizing the value to be constructed (Zwikael, 2008) and getting closer to corporate strategy (Zwikael, 2008; Normann & Ramirez, 1993; 1994). Consequently, value creation becomes a new dimension of project success. Combined with the traditional iron triangle (cost, time, and scope), value creating assumes a relevant position, becoming the focus of corporate strategy (Normann & Ramirez, 1993; 1994). Even though project success assessments are still related to time and budget concerns (Alami, 2016), many projects can run over time and budget and been considered successful if they produce value for their organization (Turner & Xue, 2018).

However, focusing on value and benefits delivery was not sufficient to be aligned to SD-L. Normann and Ramirez (1993:69) reformulated the value chain notion into a new logic in which “the goal is no more to create value for customers but to mobilize customers to create their own value from the company's various offerings”. After some time, Davies (2004) developed a stream of continuous value creation process along a system lifecycle of multiple organizations. According to Payne et al., (2008:86), “value proposition exists in order to facilitate the cocreation of experiences. Creating customer experiences is less about products and more about relationships which the customer that has vis-a-vis the total offering. It involves focusing on ‘value-in-use’ instead of mere product features”. This new concept of value cocreation is aligned with the service-dominant logic (SD-L) paradigm described by Vargo et al., (2008, p.148): “Value is always uniquely and phenomenologically determined by the beneficiary”.

Following this change of the relationship between projects and value creation, the transition between project execution to production has gained more attention. Morris (2013) proposes a reformulation in project management methodology, expanding its scope from the front-end until the end of the asset's lifecycle, and introducing the customer as a co-participant in the value creation process. The author also suggests that project management activities should aim to add value by achieving the outcome desired by stakeholder organizations. In this new approach, the work integration among organizations, in a project's multi-organizational system, is the core element to value creation in project management.

According to Artto et al. (2016) this dynamic link of multiple organizations is also present in the project-to-operations interface. The project management activity must foster the creation of a network of multiple organizations that evolves to a multi-organizational entity, capable to continue the value creation in the operations phase as an adaptive and self-organizing system. Locatelli et al. (2020) argues that the transition between project execution to production is the most important one, as it is the moment when the outputs are assessed. Part of the value created may be lost in this interface, not being realized in operation phase.

In this new value stream paradigm, the value is no more delivered. According to Vargo et al., (2008, p.148), "The enterprise cannot deliver value, but only offer value propositions". Consequently, organizations should stop to create value and mobilize their customers to create their own values from the benefits generated by projects (Normann, 2001). More than mobilize the customers to actively participate in the value creation, Winter and Szczepanek (2008) propose a resignification of the business concept incorporating the customer of the customer (a second level of customer) in the perspective of project success. Thus, the customer role is no longer a single "receiver" of the value delivered by the project, but a co-producer and co-designer of value creation. Projects, in turn, start to deliver benefits instead of value.

Pulse of Professional Report (2021) argues that a more innovative mindset must be fostered focusing on delivering value to the customer as a key modification to achieve better results. According to the report, changing the focus from the product towards the customer is at the top-three drivers of project success.

Although the concepts of value and project success are closed interrelated, they are not the same thing. Project success is resultant from both outputs and outcomes. Output is the result of the project implementation performance, or the 'project management efficiency', while outcome represents the project benefits performance, or the 'project success' (Cooke-Davies, 2002; Serrador & Turner, 2015; Turner & Zolin, 2012).

Value, on the other side, is resulted from the project's outcome. According to APM (2012), value is defined as "the ratio of 'satisfaction of requirements over use of resources'" (p.244). Smyth and Lecoivre (2015) differentiates value from outcome and argue that value is proposed in the beginning of the project and delivered during its execution but can be perceived only in the long-term as the benefits provided through the asset delivered by the project. Hence, projects can be considered successful if they produce value for their organization, independently from its outputs, as stated by Turner and Xue (2018).

Martinsuo et al. (2019) affirm that project success cannot be anymore assessed merely in terms of goals reached at the time of project completion, but also in terms of benefits compared to costs and value achieved over the project's lifecycle. To complete the project success assessment, the value delivered must be compared to the original value expectations of the various stakeholders involved (Martinsuo et al. ,2019). But value can assume tangible and intangible forms and perceived differently by the different stakeholders involved in a project. Multiple stakeholders do not value all dimensions of equal importance to achieve project success and therefore, relevant dimensions varied between stakeholders' groups with different perspectives (Davis, 2016). Turner (2015) affirms that there is no consensus among stakeholders about success dimensions, as long as they give different level of importance to each criterion. Thus, success criteria must reflect different interests and viewpoints, as project outcome is assessed differently by the various stakeholders (Shenhar et al., 2002).

1.1. RESEARCH PROBLEM

Therefore, it is necessary to include the customer as a co-participant in the value creation process during project execution, as proposed by (Morris, 2013), in order to maximize value construction and realization, while reducing possible value slippages. It is also fundamental that the multiple organizations involved in the project can evolve to become a multi-organizational entity, which is capable to continue the value creation in the operations phase as an adaptive and self-organizing system, as argued by Artto et al. (2016). These requisites are especially important in the transition between project execution to production, when the project's outputs are assessed, as declared by Locatelli et al. (2020).

The challenge is how to manage this integration between project team, customers and other stakeholders, if they have different understanding concerning the criteria they perceive as important, and this criteria changes over time, as argued by Turner and Zolin (2012). Each

stakeholder has different perceptions regarding the benefits resulting from the project (Toor & Ogunlana, 2010; Chang et al., 2013). Thus, they tend to recognize differently the result of a project, according to his perceptions, as they normally have distinct vested interests in each project (Bryde & Brown, 2005). The adaptive methodology tends to naturally reduce these perceptions' gaps, but the stakeholders still have distinct interests and prior experiences. Furthermore, a full adaptive methodology is not suitable to all kind of projects and the plan-driven methodology must adopted in some of them. A hybrid arrangement can be the solution, but the companies face challenges in adopting agile practices and tend to abandon them or implement improperly (Rumpe & Schröder, 2002).

The ground of these different perceptions comes from cognitive psychology. As explained by Johnson-Laird (1980), individuals' personal life experiences, perceptions, and understandings of the world are the base of a construct named mental model. People reasoning according to possibilities compatible with some premises and with their general knowledge about a physical system, rather than making use of formal rules of inference (Johnson-Laird, 1983).

In other words, mental models are organized knowledge structures that allow individuals to interact with the environment, draw inferences, explain the behavior of the world around them, and construct expectations for what is likely to occur next (Johnson-Laird, 1983; Rouse & Morris, 1986). Jones et al. (2011) argue that individuals make use of their mental models, as cognitive representations of external reality, to structure their reasoning in the decision-making process, while Gray et al. (2014) defend that individual uses mental models as heuristic devices to support the acquisition of knowledge incrementally under conditions of complexity and uncertainty.

Based on this intrinsically characteristic of human beings, it is hard to consider that all stakeholders will value equally the benefits generated by the project's outcomes. Individual mental models underpin the different perceptions of multiple stakeholders, concerning the value realization by the projects. Moreover, the literature has shown that the value is no longer delivered but constructed by the projects and made available to be realized by the customer after the project is closed. To maximize the value construction, the customer must actively participate of the project execution as a coproducer of the value. This reality leads to a challenge which drives this thesis: **How to effectively support the value construction during project execution, considering the multiple stakeholders' perceptions of value realized, grounded on their individual mental models?**

1.2. OBJECTIVES

Based on the available academic literature about the topic and on the context briefly presented in the introduction section, the aim of this thesis is to discuss how to effectively manage the value construction during project execution. It is necessary to consider that projects have multiple stakeholders and each of them will have its individual perceptions of the value to be realized by the benefits generated by the project's outcomes. These different perceptions of the value realized are grounded on their individual mental models, which are characteristic of the humans' cognitive process.

A suitable value management during project execution can result in a better outcome and allow benefits realization and the satisfaction of customer needs. Consequently, the value constructed and offered by the project will be effectively realized in operations phase through the project's outcome (value in use). Thus, this thesis is grounded on the following main objective:

Main objective:

Propose a theoretical framework to support value construction during project execution, considering the multiple stakeholders' perceptions of value realized grounded on their individual mental models.

This main objective is segmented in three secondary objectives:

1. Identify how value delivery in projects is covered in the academic literature through the identification of the different thinking lines and how they are interrelated
2. Identify gaps and similarities of multiple stakeholders' groups concerning their perceptions of value realized by the outcome of the project, adopting mental models and shared mental models as theoretical lenses
3. Propose a theoretical framework to support the value construction during project execution, considering the multiple stakeholders' perceptions of value realized, grounded on their individual mental models.

1.3. JUSTIFICATION

The PWC Global PPM Survey (2014) detected a gap between what the executive team thinks about program delivery and what staff and project managers believe. According to the PWC report, almost 50% of the respondents consider that decision making across the portfolio process is not supported by a methodological approach to ensure the necessary alignment to the organization's priorities to deliver the necessary value. The same report states that benefits not being realized is the third reason for project failure and affects 22% of the projects, probably not by chance.

Projects are seen as a tool to provide planned benefits to their customers and realize some value, but the PWC report shows that the organizations are failing to achieve this objective. Benefits becomes reality through the satisfaction of the end-users' needs and wishes, which depends on the project's outcomes. Value, in turn, is the result of benefits realization and can assume tangible and intangible dimensions. Due to its intangibility, value can be perceived differently by each stakeholder, and this perception can change over time, according to environmental modifications.

Output and outcome are parts of the project result. Outputs are concerned with the short-term results, which are normally the result of an efficient management of the project. Outcomes, on the other hand, are responsible for medium- and long-term results, which are derived from the satisfaction of customers' needs and the benefits realization. As the value realization depends basically on the project's outcomes, decisions taken during the project execution stage must prioritize project's outcomes and value realization, even if the outputs have to be sacrificed somehow.

Stakeholders are normally aware about the relevance of the outcomes, but they prioritize the outputs and outcomes differently, depending on their position in the project, which creates some ambiguities (Cox et al., 2003). Moreover, the stakeholders have different perceptions of the value realization as well, due to their cognitive process. Unfortunately, gaps of perceptions can appear in the very early stages of the projects, during the gathering of the customer's requirements (Stork & Sapienza, 1995; Jiang et al., 2002). This gaps normally generate residual risks in plan-oriented projects, which can compromise the project performance (both output and outcome) if not properly managed during project execution stage (Jiang et al., 2009).

A perception gap is formally defined as the existence of multiple and conflicting interpretations about an organizational situation by different stakeholders (Daft et al., 1987;

Lyytinen, 1988; Jiang et al., 1998). According to Davidson (2002), the perception gap is normally shaped by the different backgrounds of the various stakeholders and Jiang et al. (2009) argue that the stakeholder's perceptions can, potentially, increase the residual performance risk of a project. The perception gaps happen because stakeholders have individual mental models, which is intrinsic of the human cognitive psychology. Thus, the perception gaps cannot be fully eliminated. A closer relationship with the main stakeholders, mainly the customer, can minimize these gaps and, consequently, maximize the creation of value, as proposed by the value-centric paradigm of project management.

The co-participation of the customer in the project execution phase is encouraged in the adaptive methodology, but more difficult when the traditional project management methodology is adopted, as the stakeholders, mainly the customer, are normally kept distant of the project team most of the time in the execution phase. The value of adaptive methodology over the traditional one is a focus on people's interactions within a project as one of the primary drivers of success (Highsmith & Cockburn, 2001).

Unfortunately, the adoption of an adaptive approach is not a question of choice, as there are kinds of projects to which this methodology is not suitable. As stated by Rahmanian (2014), the "plan-driven approach is more suited for large-scale project with heavy constraints, large risks, and clear up-front requirements. Agile approach, on the other hand, is more suitable to small-scale projects with less rigid constraints, smaller risks, and unclear requirements" (p.1096). Consequently, the vice-versa is also true, as the pure agile method is not enough for many projects (Rahmanian, 2014). Hayata and Han (2011) argue that it is more realistic to think that the real workplace takes the hybrid development rather than treating traditional and adaptive as separate processes. Blending some agile practices with the plan-driven methodology can bring gains, instead chosen one of the methodologies, as stated by the authors.

According to Yu and Petter (2014) agile practices can enable higher level of collaboration inside the project team, and with the customers, through promoting a shared understanding of the tasks to be performed and of the team skills. Despite the benefits of agile practices being largely mentioned, organizations face difficulties to choose and adopt the most suitable agile practice(s) that fit to their needs (Rumpe & Schröder, 2002). Normally, the organizations do it subjectively and erratically and tend to abandon the practices (Rumpe & Schröder, 2002) or implement them improperly (Murphy & Norton, 2010). Based on this reality, Yu and Petter (2014) propose to apply shared mental model's theory to understand the value of agile practices in building two types of shared mental models within a project team: teamwork and taskwork.

Therefore, this thesis proposes a theoretical framework aiming to reduce the gap of the perceived value to be constructed during project execution stage. The application of the proposed framework aims to support the project manager to choose the most suitable agile practices in plan-driven projects, creating a hybrid configuration. The role of the agile practices in this context is to promote a common understanding of the tasks to be executed and of the team skills, with the objective of maximizing the value construction and reducing the value slippage

1.4. THEORETICAL BACKGROUND

The aim of this section is to give a brief theoretical foundation about value delivery; stakeholder's perception gap of value realization; mental models' theory; and shared mental models' theory. This theoretical foundation supports the discussions realized in the further sections of this thesis. Each single study has its own theoretical background supporting the discussions developed inside them. Thus, it is not the objective of this section to exhaustively discuss these topics in theoretical terms.

1.4.1 Value delivery

In the business domain, Bowman and Ambrosini (2000) define value as the buyer's willingness to pay for the product, or service, based on the benefits it can provide. Within the project management scope, most of what is currently known about value is founded on the concept of value chain, postulated by Porter (1985), based on concepts brought from manufacturing and production (Turner, 1999; Grundy & Brwon, 2002; Winch, 2002). In the context of projects, value delivery can be calculated from the relation between benefits and disadvantages arising from the project itself and the use of the product or service generated by it, throughout its lifecycle (Ahola et al., 2008; Zwikael & Smyrk, 2012).

More recently, the projects' approach has changed in the direction of business strategy implementation, improving organizational effectiveness, managing the realization of stakeholder's benefits and value delivery (Winter & Szczepanek, 2008). The emphasis is on the integration of projects with business strategy (Morris & Jamieson, 2004; Brady et al., 2005; Levine, 2005; Ward, 2005), thus the traditional iron triangle, representing the operational

efficiency (Dvir et al., 2006), is no longer sufficient to consider a project well succeed (Cohen & Graham, 2001).

As argued by Zwikael (2008), the value to be delivered takes the central position of the project (value-centric). Consequently, the value creation becomes one of the project successes dimensions and the focus of the corporate strategy (Normann & Ramirez, 1993; 1994). In this new scenario, Normann (2001) proposes to mobilize the customer to take part of the value creation through the benefits provided by the projects. Winter and Szczepanek (2008) argue that the customer of the customer also must be considered in the value creation process, being naturally included in the project success.

Therefore, the value delivery does not stop when the project is terminated, and its outcome is transferred to production. Morris (2013) considers that the value to be delivered by the project is usually first anticipated in the strategic planning, shaped during project execution, realized during operation phase, and ended upon the disposal or decommissioning of the outcome. Invernizzi et al. (2019) demonstrates that this value can even assume negative figures at the end of the lifecycle (e.g., nuclear power plants and dams).

As the value is realized when the project's outcome is used (value-in-use), it is necessary to extend the traditional lifecycle of a project. Artto et al. (2016) define this extended lifecycle as "system lifecycle", starting in the front-end, when the future outcome is still a concept, and terminating in the back end of the outcome, when the asset is retired. Obviously, there are transitions between these phases, when discontinuities can happen, and the proposed value can be modified. Locatelli et al. (2020) alerts that the transition between project execution to production is the most important one, as it is when the outputs are assessed. Artto et al. (2016) considers that nurturing the value creation along these different transitions is a critical task for the project management.

The value management is not restrained to the development team. The proposed value can be modified throughout the system lifecycle by different issues, thereby calling for integration across the multi organization system (Artto et al., 2016). Locatelli et al. (2020) considers, at least, two levels at which transitions in projects can happen: (1) the transition across the boundary between temporary project delivery and permanent organizational activity and (2) the transition points between and across the distinct phases during the project life cycle. Bowman and Ambrosini (2000) draw the attention to the complexities involved in value-creation process within the firm, and Hjelmbrække and Klakegg (2013) alert that the complexity can be even bigger in inter-organizational projects. Recent works look at the importance of

boundary-spanning activity that allows projects to fulfill their goals and organizations to collaborate (Stjerne et al., 2019).

Therefore, the comprehension of this mechanism of value proposition, creation, delivery and execution in the context of projects has become increasingly relevant. It is fundamental that the organizations understand this new scenario to really benefit from projects in a short-, medium- and long-term vision. The perspective of value management becomes a fundamental link between projects and corporate strategy.

1.4.2 Stakeholder's perception gap of value realization

Perception gap can be defined as the multiple and conflicting interpretations about a situation by different stakeholders (Daft et al., 1987; Lyytinen, 1988; Jiang et al., 1998). According to Davidson (2002), the perception gap is a complex result of social shaping and understood needs, normally shaped by the different backgrounds of the various stakeholders.

The perception gap has many implications in the project management field. The different perceptions can explain why users and IS developers have difficult to achieve the mutual understanding necessary to accomplish the goals of the project (Daft & Lengel, 1986). Some authors argue that this gap between users and developers is an additional early source of risk in projects (Cleland & Ireland, 2006; Klein et al., 2001; Schwalbe, 2007). According to Jiang et al. (2009), uncertainties from requirements creates gaps in the stakeholder's perceptions, increasing the residual performance risk of the project. As remaining risks are good predictors of eventual project management performance (Na et al., 2007; Nidumolu, 1995), it is entirely plausible to argue that perception gaps can affect project performance.

The perception gaps are present on project success evaluation as well and raises ambiguities between authors. Cox et al., 2003 divide the project success measurement in qualitative (intangible) and quantitative (tangible) indicators. The authors argue that the qualitative indicators are not so reliable due to the difficulties to be perceived and measured. Thus, different participants think differently while analyzing the performance of a project. However, Toor and Ogunlana (2010) considers that qualitative measure of project performance is not a problem because stakeholders tend to agree on most qualitative measure.

Lim and Mohamed (1999) divide project success in micro- and macro-level and explain that the macro-level is usually evaluated by the end users and project beneficiaries, according to their need's satisfaction and benefits realization, while micro-level is related to the

traditional iron triangle. Thus, micro success means profitability or short-term gains, while macro success is concerned with long-term gains, realized by the outcome of the project (Toor & Ogunlana, 2010).

Davis (2014) also detected different success perceptions between different stakeholders. The perceived stakeholder satisfaction is a consequence of the user, consumer, and customer needs fulfillment, which is relevant only to the project manager and the client/user. On the other side, the delivery of strategic benefits by the project is relevant only to the project manager and the sponsor of the project (Davis, 2014). Finally, the author detected executives are concerned only with project objectives agreement and top management support/commitment during project execution.

Thus, it is possible to assume that value delivery is far from been a consensus as a success factor of projects. Users and developers often exhibit completely different frames of reference and suffer from a lack of common basis to carry forward into the project (Laudon & Laudon, 2004). Stakeholders think differently while analyzing the performance of a project (Cox et al., 2003) because they normally have distinct vested interests in the project (Bryde & Brown, 2005). Senior executives and/or directors, for example, have a more “value-centric” view and consider value from a higher-level strategic view, while technical personnel may focus more on the output-related features (Chang et al., 2013).

Chang et al. (2013) explain that values are subjective, and dynamics and the perception of project success is diverse. The stakeholder’s perceptions of project success are influenced by the project characteristics, project stages, and their roles in the project. Moreover, stakeholder's knowledge and competencies strongly influence the perceived value (content) of the project. This value is not only functional (or commercial) but also, most importantly, experiential (cognitively and emotionally).

1.4.3 Mental models’ theory

The psychologist Kenneth Craik (1943) originally postulated the notion of mental model. The author proposed that individuals carry a small-scale model of how the world works in their minds and use these personal small models to anticipate events, reason, and form explanations. Mental models are conceived of a cognitive structure that forms the basis of reasoning, decision making, and behavior (Johnson-Laird, 1980). They are constructed by

individuals based on their personal life experiences, perceptions, and understandings of the world, (Johnson-Laird, 1980).

In other words, mental models are organized knowledge structures that allow individuals to interact with the environment, draw inferences, explain the behavior of the world around them, and construct expectations for what is likely to occur next (Johnson-Laird, 1983; Rouse & Morris, 1986). Jones et al. (2011) argue that mental models can be defined as cognitive representations of external reality, while Johnson-Laird (1986) explain that individuals can learn and solve problems based on their abstract representation of physical world.

Mental models are also dynamic and evolve continuously, contributing to individuals' evolution. Analogical thinking allows people to "create new mental models that they can then run to generate predictions about what should happen in different situations in the real world" (Collins & Gentner 1987:243). Jones et al. (2011) point out that the mental model construct can enhance our capacity to understand the motivations for human behavior, where other social science constructs, such as attitudes, values, and beliefs, fail to explain this.

Other authors advanced the understanding of mental models. Jones et al. (2011) concluded that individuals make use of their mental models to structure their reasoning in the decision-making process. More recently, Gray et al. (2014) highlighted that individual uses the cognitive representations as heuristic devices to support the acquisition of knowledge incrementally overcoming the limitations of human cognition under conditions of complexity and uncertainty.

Although incomplete and inconsistent representations of reality, as any other model (Lynam & Brown, 2012), the literature has an overall agreement that mental models are "working models" (Craik, 1943; Johnson-Laird, 1983) and are, therefore dynamic in three ways: Reasoning (explore and test different possibilities mentally before acting); Causal dynamics (represent perceived cause-and-effect dynamics of a phenomenon); and Learning (the capacity to change over time through experience and learning based on information feedback loops) (Jones et al., 2011). According to Lynam and Brown (2012), mental models change over time, can adapt to changing circumstances, and may evolve through learning.

In the field of project management, some studies already explored this theory to understand stakeholders' construction of how the system functions and what values might be brought to bear on actual practices. Daniel and Daniel (2018) suggest that a more appropriate contingent and comprehensive management approach can be selected by project managers based on a better understanding of the complexity and uncertainty involved in the projects and their management.

Broadening the conclusions of Jones et al. (2011) into the project's environment, it is possible to argue that the mental model construct can give insights into how stakeholders perceive and tend to act toward the context around them. A mental model approach goes beyond stakeholders' preferences, goals, and values associated with a given situation and can provide a rich picture of how stakeholders perceive the value delivered by the projects, which is very important to project managers.

1.4.4 Shared Mental models' theory

Based on the mental model's theory from Johnson-Laird (1980), Cannon-Bowers and Salas (1993) proposed the shared mental model's theory considering a team as a unified information processing unit. The authors defined shared mental models as the "knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task, and, in turn, to coordinate their actions and adapt their behavior to demands of the task and other team members" (p. 228). Thus, shared mental models provide the team with an internal knowledge base that allows the members to decide what actions to take when novel events happen, maintaining a shared understanding within the team (Cannon-Bowers & Salas, 1993).

Shared mental models contributes to enhance the team achievements. Many studies have shown a positive relationship between team performance and similarity between mental models of team members (Bolstad et al., 1999; Lim & Klein, 2006; Mathieu et al., 2000). While heterogeneity of team members can strengthen a team by leveraging diversity, shared mental models' theory proposes that effective teams need to maintain a shared understanding, essential for accomplish the tasks. Consequently, teams rely on essential cognitive processes to build shared mental models (McComb, 2007; Warner et al., 2005; Van et al., 2011).

Mental model theorists involved in organizational research take a particular interest in the development of "collective or shared" mental models as a way of enhancing team performance (Langan-Fox et al. 2000, 2001). The effective functioning of teams requires the existence of a mental model shared by team members (Langan-Fox et al., 2000). Thus, shared mental models' theory offers the mechanisms of adaptability necessary to teams rapidly and efficiently adjust their strategy "on the fly" (Mathieu et al., 2000). This flexibility is very important, as the ability to adapt is an important skill in high-performance teams (Cannon-Bowers et al., 1995). Although mental models' approaches may not make conflicted groups to

work together, they may identify where lie the differences and similarities in their conceptualizations and bring better collaboration and enhance collective decision making (Du Toit, 2011).

A team model is the collective knowledge that team members bring to a specific situation. In other words, team model is the collective understanding that team members share about a specific situation, also termed the ‘team situation model’ (Cooke et al., 2000). Yang et al. (2008) showed that higher shared mental models improved team learning and performance, while Xiang et al. (2016) found out that shared mental models have positive impact on the performance of project requirement analysis.

1.5. STRUCTURE OF THE THESIS

This thesis is organized in multiple and interrelated studies and each of them brings specific contributions to the thesis, following what is postulated by Costa et al. (2019). Three studies were developed in this thesis, as explained in Figure 1. Each of them has specific objectives and represent one step towards the main objective of the thesis.

The first one is an exploratory study aiming to comprehensively understand how the academic literature covered the delivery of value in projects up to now. The second study investigated the differences and similarities of multiple stakeholders concerning their perceptions of the value offered by the projects. Mental models and shared mental models’ theories were adopted as theoretical lenses to explain the gaps and similarities detected by the survey. Study 3 closes the thesis proposing a theoretical framework to support the reduction of the perceptions gaps among multiple stakeholders, during project execution, promoting a shared understanding of the tasks to be done and of the team skills. The shared understanding aims maximizing the value construction. The multiple stakeholders’ perceptions of value are grounded on their individual mental models, while the shared understanding of the tasks to be done and of the team skills is grounded in shared mental models’ theory.

Study	Title	Research question	Main objective	Research method	Data Collection Procedures	Data Analysis Procedures	Status
1	A Bibliometric Study about Value Delivery in Projects Environment	What is the current intellectual framework regarding the concept of "value delivery" in the context of projects?	Determine how the literature has approached value delivery in the context of projects, aiming to show the actual "state of the art" in this topic	Bibliometric study applying Citation and Cocitation techniques	Search in WOS and Scopus; string defined based on a preliminary analysis of the literature about the topic	Exploratory Factor Analysis and detailed reading of the articles selected	Presented in SIMPOI2022 Submitted to Holos Journal
2	Understanding the Stakeholder's Different Perceptions of Value Realization by Projects Through the Mental Models' Theory	Does different groups of stakeholders of a project have the same perception about the value realized by the outcome of the project?	Adopt mental models and shared mental models as theoretical lens to investigate and understand the stakeholder's different perceptions about value realization	Empirical investigation	Survey with 183 practitioners, representatives of four groups of stakeholders: senior management; project manager; project team; and project recipients	Analysis of Variance (ANOVA)	To be submitted
3	A Theoretical Framework Proposition to Support Value Construction Based on Stakeholders' Perceptions and Shared Mental Models' Theory	How to use shared mental models' theory to support value construction, during project execution, based on stakeholders' perceptions?	Propose a theoretical framework to support value construction during project execution, considering the multiple stakeholders' perceptions of value realized, grounded on their individual mental models	Theoretical study	Literature	Theoretical investigation	To be submitted after framework patent

Figure 1 - Methodological matrix

Source: Author

2 METHODOLOGICAL PROCEDURES

A thesis from a professional doctoral program must propose a solution to a specific problem, which cause any kind of disturb in the practitioners' environment. Thus, it is expected that the result of this thesis brings relevant results to the practical world.

Van Aken (2011) argues that the prescription of a solution based on science tends to shorten the distance between theory and practice. The choice of the most appropriate research method is fundamental do reach the objectives of a scientific research (Ghauri & Gronhaugh, 2005). The authors explain also that the scientific research is a process formed by tasks and subdivided in sequential steps, where insights can emerge gradually.

2.1. RESEARCH DESIGN

The three studies of this thesis were executed in a logical sequence to achieve the main proposed objectives of the thesis. Each of them has its individual objectives and contributions, as presented in figure 2. They were necessary to gradually construct the solid foundation to propose a framework which aims to solve a problem that causes concerns to the practitioners.

The further subsections succinctly describe each of these studies, culminating with a description of the technological products delivered by this thesis as theoretical and practical contributions.

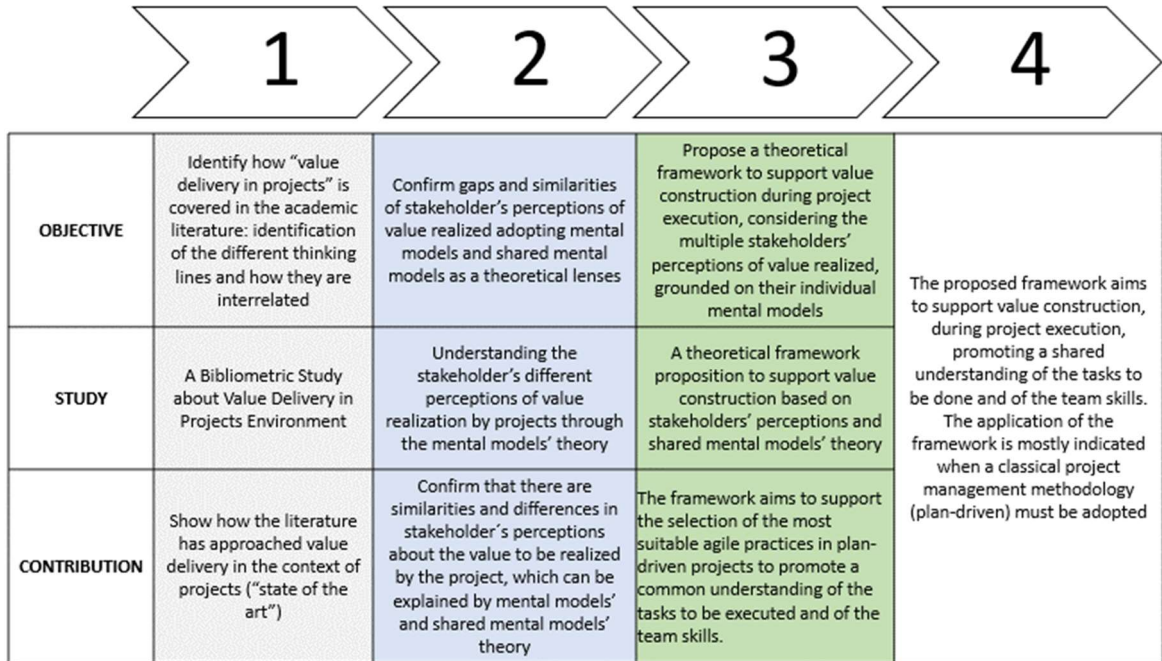


Figure 2 - Research design of the thesis made through sequential studies

Source: Author

2.2. STUDY 1 - A BIBLIOMETRIC STUDY ABOUT VALUE DELIVERY IN PROJECTS ENVIRONMENT

Study 1 (Appendix A) is an exploratory scanning of the available academic literature concerning value delivery in projects through a bibliometric study, aiming to comprehensively understand how the academic literature covered the delivery of value in projects up to now. The main objective was to determine how the literature has approached value delivery in the context of projects so far. This way it was possible to determine the actual “state of the art” in this topic. This central objective was divided in three secondary objectives:

- 1) Identify the literary works recognized as reference of this topic
- 2) Identify the different lines of thought from the central topic researched
- 3) Identify how the different lines of thought are interrelated

Both citation and cocitation analysis indicated a predominance of articles focused on the front-end phase of NPD projects. Five clusters emerged from the cocitation analysis: Front-end of projects aimed at New Products Development (NPD); Value management; Economic viability in large projects; Project management approaches; and Methodological approach in project management research. This result indicates the predominance of discussions on issues

like strategic importance of the front-end phase, and cost underestimation to enlarge the economic viability. Moreover, shows that the need to adapt the project management practices to the new context of value creation is already in discussion by the academics.

Therefore, the role of project management activities has already been discussed and reviewed and adapted to these conceptual changes. Project managers must adapt their mindsets to value-centric projects, being more strategic in their decisions with a medium- and long-term vision, concerning the benefits to be generated to the customers. The literature still indicates that value delivery is present on the value stream in the context of projects, answering the research question initially proposed to this study.

The concept of value creation is gaining importance, but gaps remain opened. Studies focused on creation, cocreation, delivery and capture of value focus mainly at the execution phase, while projects post-completion phase is little addressed by the literature. The transitions between the phases of the system lifecycle are little discussed as well, mainly between execution and operation phases, which is a critical moment on the system lifecycle and to the value construction. The different perceptions of the multiple stakeholders concerning the value delivery, or creation, lacks a better understanding, as perceptions gaps can be source of residual risks which can jeopardize the project results.

2.3. STUDY 2 - UNDERSTANDING THE STAKEHOLDER'S DIFFERENT PERCEPTIONS OF VALUE REALIZATION BY PROJECTS THROUGH THE MENTAL MODELS THEORY

The second study investigated how multiple stakeholders perceive the value offered and realized by the projects. A total of 183 respondents participated of a survey based on the Shenhar and Dvir (2007) scale of project success, adopted as a proxy, as no specific scale to measure value realized by projects was achieved in the literature. The result shows gaps and similarities of perceptions among four groups of stakeholders: senior executives, project managers, development team, and project recipients.

The similarities are in the short-term benefits (project efficiency and benefits to the customer), while gaps are concentrated in medium- and long-term benefits (impact on the team, business success, and preparation for the future). Basically, the project recipients' group, formed by customers and end-users, have a different perception about the value realized, when compared to the other groups investigated. As value can assume tangible or intangible forms,

it cannot be measured objectively. But this survey showed that multiple stakeholders perceive differently the value offered by the projects and realized by the project's outcome.

Results are partially in accordance with Davis (2014). According to the author, there should have no agreement in stakeholders' perceptions, generally speaking. Small differences between Davis (2014) research and this thesis need to be declared. While Davis (2014) studied the stakeholders' perceptions of project success factors, this thesis adopted a project success scale to investigate the stakeholders' perceptions of value realized by the projects. Despite these differences, it is important to examine why there is a gap in multiple stakeholders' perceptions and the consequences derived from this finding.

Mental models and shared mental models' theories are proposed to ground the comprehension of how humans' cognition process works and evolve over time, according to environment situations, individual experiences, and knowledge. Consequently, these theory lenses can provide a better clarification on the reasons that leave individual stakeholders perceive value realization differently from each other.

A mental model approach to cognition goes beyond stakeholders' preferences, goals, and values associated with a given situation and can provide a rich picture of how stakeholders understand and assess the value delivered by the projects. Shared mental models' theory is proposed by Yu and Petter (2014) to foster high levels of interaction and collaboration inside a team through the application of suitable agile practices to promote a shared understanding of the teamwork and taskwork. The authors indicate the enhancement of the team performance as a consequence of the shared mental models created.

Based on mental models construct, each stakeholder will always perceive the value realized by projects differently, according to his/her own experience, background, and individual interests, without considering the other stakeholders. Consequently, it seems quite impossible to achieve a consensus, as proposed by Davis (2016). Starting from this premise, the comprehension of this cognition mechanism of human beings becomes fundamental to allows project managers taking proper decisions during project execution in order to adequately prioritize the outcomes and, consequently the value realization through benefits achievement.

2.4. STUDY 3 - A THEORETICAL FRAMEWORK TO SUPPORT VALUE CONSTRUCTION BY PROJECTS BASED ON STAKEHOLDERS' PERCEPTIONS AND MENTAL MODELS' THEORY

The conceptual framework proposed in the third study aims to support the project manager, during project execution stage, to reduce the gap of the perceived value to be constructed by the project, adopting the most suitable agile practices to create a hybrid configuration, to develop a shared understanding in the project team. This main objective is divided in three secondary objectives:

- Present a broader understanding on how different concepts are interrelated in the value management, based on the value stream (Davies, 2004; Morris, 2013), system lifecycle (Arto et al., 2016), and transitions between lifecycle phases (Locatelli et al., 2020).
- Present the mental models' theory as the base to explain why and how multiple stakeholders have different perceptions of the value realized by the projects.
- Propose an artefact to reduce the gap of value perception in classical project management, adopting the agile practices most suitable to develop a shared understanding among the project team.

The relationship among concepts like value stream (Davies, 2004; Morris, 2013), system lifecycle (Arto et al., 2016) and its transitions (Locatelli et al., 2020) is already broadly discussed by the literature, but not yet put together in a framework like is proposed in the third paper. These concepts together form a baseline to adapt the project management to the paradigm of Service Dominant Logic (SD-L), proposed by Vargo and Lusch (2004), including the customer in the project execution phase, as co-creator of value, looking to the second level of customer (customer of the customer). Thus, the projects become value-centric, instead of product-centric.

More than including the customer in the value construction, the decisions making during project execution must prioritize the outcome. Thus, the framework proposes to make use of mental models (or decision models) to link risk and uncertainty by the capacity to predict future results of decisions, like proposed by Daniel and Daniel (2018). According to the authors, projects with higher level of complexity and uncertainty configures a non-deterministic paradigm, or emergence paradigm, which cannot be managed by the classical project management method.

Additionally, the proposed framework aims to support the process of choosing the most suitable agile practices to be applied in the emergence paradigm to reduce the multiple stakeholders' perception gaps during project execution. As proposed by Yu and Petter (2014), the employment of agile practices contribute to develop a common understanding inside the project team, or a shared mental model. The possibility to assess and choose the most suitable agile practice according to the contingencies, complements the emergence paradigm of Daniel and Daniel (2018).

Mathieu et al. (2000) argue that shared mental models is crucial under critical conditions (difficult communication, excessive workload, time pressure) because allow teammates to act based on their understanding of the task demands impacting the team's response. According to Cannon-Bowers (1993), it is common to have multiple mental models co-existing at a given time, which can be shared among team members, promoting a common understanding inside the team.

Finally, this framework is concerned about how value is perceived by multiple stakeholders. As value is realized by the benefits generated by the project's output and outcome, and can assume tangible or intangible forms, it cannot be objectively measured. Thus, value is normally perceived by the stakeholders, instead of measured. As each stakeholder has its own expectations about the project, a consensus about the value realized by the project seems very difficult, independently of the project management approach adopted.

The framework presented proposes to adopt mental models' theory to understand why and how gaps and similarities of value perception can occur among multiple stakeholders. Mental models are inherent to human cognition process, and represent the way an individual interprets the world, take decisions, and predict possible results. Thus, the comprehension of how mental models influence the value perception can help project managers in the decision-making process, supporting the outcome prioritization.

3 TECHNOLOGICAL PRODUCT

A technological product can assume the shape of a product or a process, which can contribute to practitioners solving practical issues. According to CAPES (2019) definition, a technological product must be tangible and have a high innovative level, developed in the field of post-graduation, and resulted from the application of new scientific knowledge, technics, and

expertise. A technological product must be employed to solve problems from organizations, aiming at social welfare.

The theoretical framework developed in this thesis is classified by CAPES (2019) as a non-patentable process/technology and product/material. Thus, legal impediments means that the framework cannot be patented in Brazilian territory. The technological product is classified in five criteria proposed by CAPES (2019): adherence, impact, applicability, innovation, and complexity.

The adherence of a technological product must be assessed concerning the research line of the *stricto sensu* program, focused on project strategies. A deeper understanding of the different perceptions of multiple stakeholders concerning the value construction and realized by the projects' outcome allows a better alignment between projects and company's strategies and contributes to decision-making process during the project execution. Knowing the reasons that leave stakeholders to assess differently the value realization contributes to further studies focused on project strategies. Consequently, the proposed technological product of this thesis meets the criterion of adherence in a high degree.

In terms of the impact on the project management field, a framework able to support the project manager during the project execution, concerning the value to be constructed and offered to the customer has a relevant role, because aims to maximize the value construction and minimize possible value slippage, contributing to achieve a higher performance of the projects in a medium- and long-terms. Thus, it is possible to classify the proposed technological product with a high degree.

The applicability of the framework proposed is considered high because it can be applied in any kind of project regardless its field (industry, IT, health, infrastructure, or others) and its outcome (product, service, or the association of both). Potential users of this framework should have very primary knowledge about mental models and cognitive processes to apply it.

Concerning innovation criterion, the proposed framework uses known concepts to propose a solution to a known issue from the practitioners. The innovation comes from how these concepts are arranged together and interrelated to work as a framework capable of helping practitioners in the field. Thus, the proposed framework can be classified as a medium degree in terms of innovation.

Finally, to analyze the complexity of the proposed technological product, it is necessary to consider that value is very broad topic and human perceptions are based on human cognitive process, thus are totally subjective and dynamic. The other concepts used in the framework can be considered of high complexity as comes from other fields (marketing and

psychology) and are quite recent. Moreover, arranging these concepts together and interrelated between each other represents a high level of complexity. Thus, the proposed framework can be classified as having a high complexity.

Figure 3 shows the combined assessment of the technological product resulted from this thesis.

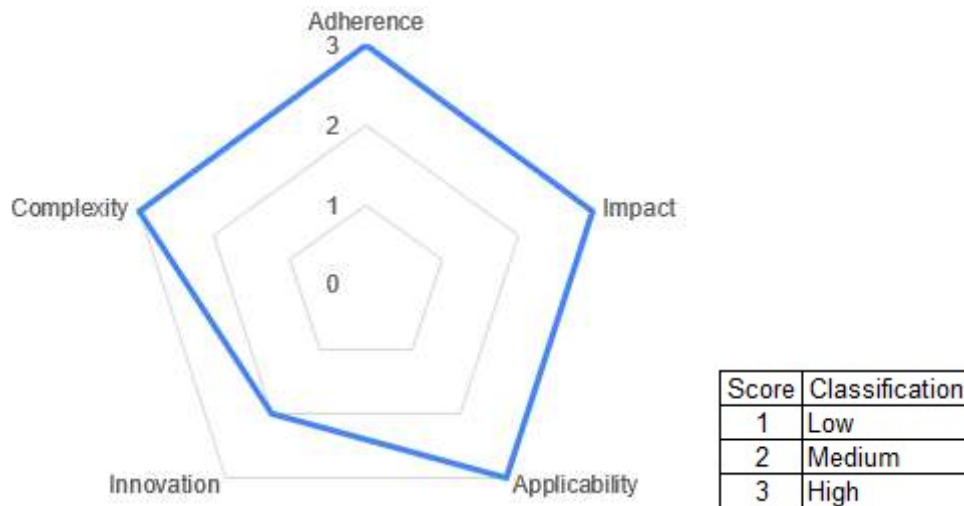


Figure 3 - Technological product assessment

Source: Author

4 CONCLUSION AND CONTRIBUTIONS

Organizations face difficulties to use projects as a tool to provide the planned benefits and realize value. Part of these difficulties comes from the complexity to prioritize the project's outcome as the stakeholders have different perceptions of value realization due to their cognitive process, named mental models. It is also very difficult to approximate the customer, as a co-producer of value, and the project team due to their different interests and knowledge, which is part of their individual mental models as well.

Adaptive methodology could be a solution, but it cannot be adopted to all kinds of projects. Thus, a hybrid combination seems to be the best solution to plan-driven projects. But organizations also face difficulties to choose the suitable agile practices to promote a shared understanding among the team, concerning taskwork and teamwork. The result is some loose of resources, value slippage, and unsuccessful projects.

The framework proposed by this thesis aims to help project managers to overtake these challenges and maximize the value construction during the project execution, reducing the perception gaps and properly prioritizing the project outcomes. Shared mental models' theory

aids with the assessment and choice of the most suitable agile practices, concerning the contingencies surrounding the project. Share mental model's development process aids to foster a shared understanding of the tasks to be executed (taskwork) and the team organization according to its potentialities (teamwork), enhancing the team performance.

The confirmation that the multiple stakeholders really have different perceptions of value realized by the projects was a fundamental step to develop the framework here proposed. Moreover, the understanding that mental models are the reason of how and why each stakeholder has its individual perception of the value realized was particularly important to propose shared mental models as the ground to foster a shared understanding inside the team.

Finally, the bibliometric study provided a clearer understanding concerning how the concepts which orbit the value-centric paradigm are interrelated and contribute to manage the value throughout the system lifecycle. Value is no longer delivered by the projects in the value centric paradigm, as it was in the product centric paradigm. Instead, in the value centric paradigm, value is created, or cocreated, during project execution stage and offered at the project closure to be realized by the customer, during operation stage. Thus, the value in exchange is replaced by a value-in-use in the value centric paradigm. Finally, the bibliometric study revealed that value can assume tangible and intangible forms and are realized from the benefits generated by the project's outcome.

The comprehension of the reasons that leave the multiple stakeholders perceive the value differently pave a grand avenue for further research. As mental models are individual understanding of the physical world, and mental models are considered complex and dynamics, a convergence around the value realized is almost impossible. As value realized and project success are linked by the project's outcome, the convergence around project success seems also difficult to be achieved.

The premises and proposals presented by this thesis are based on the literature and on the result of a survey realized with Brazilian practitioners. Thus, other practitioners should be consulted to be compared with the results here presented. Moreover, in-depth research should be executed in the future to provide a better comprehension of the phenomena here analyzed. Longitudinal in-depth research could confirm eventual changes of stakeholders' perceptions over the time and maybe establish a cause-and-effect relationship. The framework here proposed is not yet empirically validated. A validation under real conditions would certainly allow for improvements and adjustments. Finally, the bibliometric study gave an overview of the existing literature about the theme and how the concepts are interrelated. A coupling study could be

carried on in the future and would bring the tendencies in terms of emergent new clusters in the topic.

The academic contributions include a broader understanding of how project management practices influence the value management concerning the value stream (Davies, 2004; Morris, 2013) and the system lifecycle (Artto et al., 2016), created to adapt the project management to the Service Dominant Logic (SD-L) paradigm. The comprehension of how these concepts are interrelated to manage the value during the system lifecycle (Artto et al., 2016) is another contribution of this thesis. Finally, the application of mental models' theory to explain the different perceptions of multiple stakeholders concerning the value construction and realization by projects complete the academic contributions.

Concerning the contributions to practitioners, the understanding of how project management practices influence the value management during project execution can support project managers to reduce the value slippage and maximize the value construction and co-creation during project execution. The understanding of the different value perceptions of multiple stakeholders, through mental models' theory, can help project managers to take better decisions during project execution, prioritizing the outcomes based on a better understanding of the benefits expected by the customers and end-users. Finally, the application of the shared mental model's development cycle, concerning the project context, to foster a shared understanding inside the project team tends to reduce the gap of value perception in plan-driven projects, when a classical project management methodology is unable to guarantee the necessary efficiency of the team.

REFERENCES

- Ahola, T., Laitinen, E., Kujala, J., Wikström, K. (2008). Purchasing strategies and value creation in industrial turnkey projects. *Int. J. Proj. Manag.* 26, 87–94.
- APM. (2012). *Body of Knowledge. 6th Edition.* Buckinghamshire: Association for Project Management.
- Artto, K., Ahola, T., & Vartiainen, V. (2016). From the front end of projects to the back end of operations: Managing projects for value creation throughout the system lifecycle. *Int. J. Proj. Manag.*, 34(2), 258–270.
- Bolstad, C., Endsley, M. (1999) Shared mental models and shared displays: An empirical evaluation of team performance. *Human Factors and Ergonomics Society Annual Meeting Proceedings* 43(3), 213–217
- Bowman, C., Ambrosini, V. (2000). Value creation versus value capture: Towards a coherent definition of value in strategy. *Br. J. Manag.* 11 (1), 1–15.
- Brady, T., Davies, A., Gann, D.M. (2005) *Creating Value by Delivering Integrated Solutions.* *International Journal of Project Management*, 23 (5), Pp. 360-365. <https://doi.org/10.1016/j.ijproman.2005.01.001>
- Brookes, N., Sage, D., Dainty, A., Locatelli, G., & Whyte, J. (2017). An island of constancy in a sea of change: Rethinking project temporalities with long-term megaprojects. *Int. J. Proj. Manag.*, 35(7), 1213–1224.
- Bryde, D.J., Brown, D. (2005). The influence of a project performance measurement system on the success of a contract for maintaining motorways and trunk roads. *Project Management Journal* 35 (4), 57–65.
- Cannon-Bowers, J. A., Salas, E., & Converse, S. A. (1993). Shared mental models in expert team decision making. In N. J. Castellan, Jr. (Ed.), *Current issues in individual and group decision making* (pp. 221-246). Hillsdale, NJ: Erlbaum.

- Cannon-Bowers, I. A., Tannenbaum, S. I., Salas, E., & Volpe, C. E. (1995). Defining team competencies and establishing team training requirements. In R. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations* (pp. 333—380). San Francisco: Jossey-Bass.
- Capes - Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (2019). *Produção Técnica*. Disponível em <http://www.capes.gov.br/relatorios-tecnicos-dav>.
- Chang, A.; Chih, Y.Y.; Chew, E.; Pisarski, A. (2013). Reconceptualising Mega Project Success In Australian Defence: Recognising The Importance Of Value Co-Creation *Int. J. Proj. Manag.*, 31 (8), Pp. 1139-1153, Doi 10.1016/J.Ijproman.2012.12.005
- Cleland, D.I., Ireland, L.R., (2006). *Project Management Strategic Design and Implementation*, fifth ed. McGraw Hill, New York, NY.
- Cohen D, Graham R. (2001). *The project manager's MBA*. Jossey-Bass.
- Collins, A., and D. Gentner. (1987). How people construct mental models. Pages 243-268 in D. Holland and N. Quinn, editors. *Cultural models in language and thought*. Cambridge University Press, Cambridge, UK.
- Cooke-Davies, T. (2002). The “real” success factors on projects. *International journal of project management*, 20(3), 185-190.
- Cooke, N., Salas, E., Cannon-Bowers, J.A., Stout, R., (2000). Measuring team knowledge. *Hum. Factors* 42, 151–173.
- Cox, R.F., Issa, R.R.A., Aherns, D., (2003). Management's perception of key performance indicators for construction. *Journal of Construction Engineering and Management* 129 (2), 142–151.
- Costa, P., Ramos, H., & Pedron, C. (2019). Proposição de Estrutura Alternativa para Tese de Doutorado a Partir de Estudos Múltiplos. *Revista Ibero-Americana De Estratégia*, 18(2), 155-170. <https://doi.org/10.5585/riae.v18i2.15156>.
- Craik, K. (1943) *The Nature of Explanation*, Cambridge University Press

- Daft, R.L., Lengel, R.H., (1986). Organizational information requirements, media richness and structural design. *Management Science* 32 (5), 554–571
- Daft, R.L., Lengel, R.H., Trevino, L.K. (1987). Message equivocality, media selection, and manager performance: implications for information systems. *MIS Quarterly* 11 (3), 355–366.
- Daniel, P.A., & Daniel, C. (2018). Complexity, uncertainty and mental models: From a paradigm of regulation to a paradigm of emergence in project management. *International journal of project management*, 36(1), 184-197.
- Davidson, E.J. (2002). Technology frames and framing: a socio-cognitive investigation of requirements determination. *MIS Quarterly* 26 (4), 329–358
- Davies, A. (2004). Moving base into high-value integrated solutions: a value stream approach. *Industrial and corporate change*, 13(5), 727-756.
- Davis, K. (2014). Different stakeholder groups and their perceptions of project success. *International Journal of Project Management* 32 (2014) 189–201.
- Davis, K. (2016). A method to measure success dimensions relating to individual stakeholder groups, *International Journal of Project Management*, 34(3), 480-493, <https://doi.org/10.1016/j.ijproman.2015.12.009>.
- Du Toit, D. R.; Biggs, H.; Pollard., S. (2011). The potential role of mental model methodologies in multistakeholder negotiations: integrated water resources management in South Africa. *Ecology and Society* 16(3): 21. <http://dx.doi.org/10.5751/ES-04237-160321>
- Freeman, M., Beale, P. (1992). Measuring project success. *Proj. Manag. J.* 23 (1), 8–18.
- Ghuri, P. and Gronhaugh, K. (2005) *Research Methods in Business Studies: A Practical Guide*. Prentice Hall
- Glaser, B.G., Strauss, A.L. (1967) *The Discovery of Grounded Theory: Strategies For Qualitative Research*, Chicago: Aldine

- Gray, S. R. J., Gagnon, A. S., Gray, S. A., O'Dwyer, B., O'Mahony, C., Muir, D., ... & Gault, J. (2014). Are coastal managers detecting the problem? Assessing stakeholder perception of climate vulnerability using Fuzzy Cognitive Mapping. *Ocean & Coastal Management*, 94, 74-89.
- Grönroos, C.; Gummerus, J. (2014). The service revolution and its marketing implications: service logic vs service-dominant logic. *Manag. Serv. Qual.* 24 (3),206–229.
- Grundy T, Brown L. (2002) *Strategic project management*. Thomson Learning.
- Hayata, T., Jianchao Han (2011) A hybrid model for IT project with Scrum, this paper appears in: *Service Operations, Logistics, and Informatics (SOLI)*, 2011 IEEE International Conference on Page(s): 285 – 290.
- Highsmith, J., & Cockburn, A. (2001). Agile software development: The business of innovation. *Computer*, 34(9), 120-127.
- Hjelmbrekke, H., Klakegg, O.J. (2013). The new common ground: Understanding value. 7th Nordic Conference on Construction Economics and Organisation, Trondheim, June 12–14.
- Invernizzi, D.C., Locatelli, G., Gronqvist, M., Brookes, N. (2019). Applying value management when it seems that there is no value to be managed: the case of nuclear decommissioning. *Int. J. Proj. Manag.* 37 (this issue).
- Jiang, J.J., Klein, G., Balloun, J. (1998). Perception of system development failures. *Information and Software Technology* 39, 933–937.
- Jiang, J.J., Klein, G., Discenza, R. (2002). Perception differences of software success: provider and user views of system metrics. *Journal of Systems and Software* 63 (1), 17–27.
- Jiang, J.J.; Klein, G.; Wu, S.P.J.; Liang T.P. (2009) The relation of requirements uncertainty and stakeholder perception gaps to project management performance. *The Journal of Systems and Software* 82 (2009) 801–808.
- Johnson-Laird, P.N. (1980). Mental models in cognitive science. *Cognitive science*, 4(1), 71-115.

- Johnson-Laird, P.N. (1983). *Mental models: Towards a cognitive science of language, inference, and consciousness* (No. 6). Harvard University Press.
- Johnson-Laird, P.N. (1986). *Mental models: towards a cognitive science of language, inference and consciousness*.
- Jones, N. A., H. Ross, T. Lynam, P. Perez, and A. Leitch. (2011). *Mental models: an interdisciplinary synthesis of theory and methods*. *Ecology and Society* 16(1): 46. [online] URL: <http://www.ecologyandsociety.org/vol16/iss1/art46/>
- Klein, G., Jiang, J. J., & Sobol, M. G. (2001). *Consonance in information systems*. In *Strategies and organizations in transition*. Emerald Group Publishing Limited.
- Langan-Fox, J.; Code, S.; Langfield-Smith, K. (2000). *Team mental models: techniques, methods and analytic approaches*. *Human Factors* 42:242-271.
- Laudon, K.C., Laudon, J.P., (2004). *Management Information Systems – Managing the Digital Firm*, eighth ed. Pearson Education International, New Jersey.
- Laursen, M., Svejvig, P. (2016). *Taking stock of project value creation: a structured literature review with future directions for research and practice*. *Int. J. Proj. Manag.* 34 (4), 736–747.
- Levine H. (2005) *Project portfolio management*. Jossey-Bass.
- Lim, B., Klein, K. (2006) *Team mental models and team performance: A field study of the effects of team mental model similarity and accuracy*. *Journal of Organizational Behavior* 27(4), 403
- Lim, C.S., Mohamed, M.Z., (1999). *Criteria of project success: an exploratory re-examination*. *International Journal of Project Management* 17 (4), 243–248.
- Locatelli, G.; Zerjav, V.; Klein, G. (2020). *Editorial: Project transitions – navigating across strategy, deloivery, use, and decommissioning*. *Project Management Journal*, 51 (5), 467-473.

- Lynam, T., & Brown, K. (2012). Mental models in human–environment interactions: theory, policy implications, and methodological explorations. *Ecology and Society*, 17(3).
- Lyytinen, K., (1988). Expectation failures concept and system analysts' view of information systems failures: results of an exploratory study. *Information and Management* 14, 45–56.
- Martinsuo, M.; Klakegg, O.J.; van Marrewijk, A. (2019). Editorial: Delivering value in projects and project-based business. *Int. J. Proj. Manag.*, 37, 631–635.
- Mathieu, E., Heffner, T.S., Goodwin, G., Salas, E., Cannon-Bowers, J. (2000) The influence of shared mental models on team process and performance. *The Journal of Applied Psychology* 85(2), 273–283
- McComb, S.A. (2007). Mental model convergence: the shift from being an individual to being a team member, in: F. Dansereau, F.J. Yammarino (Eds.), *Multi-Level Issues in Organizations and Time*, Emerald Group Publishing, pp. 95–147.
- Morris P, Jamieson A. (2004) *Translating corporate strategy into project strategy*. Project Management Institute.
- Morris, P. (2013). Reconstructing project management revisited: A knowledge perspective. *Project Management Journal*, 44(5), 6–23
- Murphy, T.; Norton, D. (2010) G. Group (Ed.), *Predicts 2010: Agile and Cloud Impact Application Development Directions*.
- Na, K.S., Simpson, J.T., Li, X., Singh, T., Kim, K.Y., (2007). Software development risk and project performance measurement: evidence in Korea. *Journal of Systems and Software* 80, 596–605.
- Nidumolu, S., (1995). The effect of coordination and uncertainty on software project performance: residual performance risk as an intervening variable. *Information Systems Research* 6 (3), 191–219.
- Normann, R. and Ramirez. R. (1993), “From Value Chain to Value Constellation: Designing Interactive Strategy,” *Harvard Business Review*, 71 (July–August), 65–77.

- Normann R. and Ramirez R. (1994) *Designing interactive strategy: from value chain to value constellation*. Wiley.
- Normann R. (2001) *Reframing business: when the map changes the landscape*. Wiley.
- Payne, A F, Storbacka, K and Frow, P (2008) *Managing the co-creation of value*. *Journal of the Academy of Marketing Science*, 36(1), 83-96.
- PMI. (2021). *Pulse of the Profession: Beyond agility. Flex to the future*. Retrieved in April, 24th of 2021, from: <https://www.pmi.org/learning/library/beyond-agility-gymnastic-enterprises-12973>
- Porter M. (1985) *Competitive advantage*. Free Press.
- PWC Global PPM Survey (2014) *4th Global Portfolio and Programme Management Survey*. From <https://www.pwc.ie/todelete/publications-archive/assets/publications/2014-pwc-global-ppm-survey-12-09-2014.pdf>
- Rahmanian, M. (2014). *A Comparative Study on Hybrid IT Project Management Using Traditional Project Management and Agile Approach*. *International Journal of Computer and Information Technology*, 03(05), 2279–0764. Retrieved from www.ijcit.com
- Rouse, W. B., & Morris, N. M. (1986). *On looking into the black box: Prospects and limits in the search for mental models*. *Psychological Bulletin*, 100, 349-363.
- Rumpe, B.; Schröder, A. (2002) *Quantitative Survey on Extreme Programming Projects*, *Proceedings of XP2002*.
- Schwalbe, K., (2007). *Information Technology Project Management*, fifth ed. Course Technology, Boston, MA.
- Serrador, P., & Turner, R. (2015). *The relationship between project success and project efficiency*. *Project management journal*, 46(1), 30-39.
- Shenhar, A.J. (2001) *One Size Does Not Fit All Projects: Exploring Classical Contingency Domains*. *Management Science*, 47 (3), Pp. 394-414

- Shenhar, A.J., & Dvir, D. (2007). Reinventing project management: the diamond approach to successful growth and innovation. *Harvard Business Review Press*.
- Shenhar, A. J., Dvir, D., Levy, O., & Maltz, A. C. (2001). Project success: a multidimensional strategic concept. *Long range planning*, 34(6), 699-725.
- Shenhar, A.J., Tishler, A., Dvir, D., Lipovetsky, S. and Lechler, T. (2002), "Refining the search for project success factors: a multivariate, typological approach", *R & D Management*, Vol. 32 No. 2, pp. 111-126.
- Smyth, H., & Lecoeuvre, L. (2015). Differences in decision-making criteria towards the return on marketing investment: A project business perspective. *International Journal of Project Management*, 33(1), 29-40.
- Stjerne, I. S., Söderlund, J., & Minbaeva, D. (2019). Crossing times: Temporal boundary-spanning practices in interorganizational projects. *International Journal of Project Management*, 37(2), 347–365.
- Stork, D., Sapienza, A.M., (1995). Uncertainty and equivocality in projects: managing their implications for the project team. *Engineering Management Journal* 7 (3), 33–38.
- Toor, S. R., Ogunlana, S. O. (2010). Beyond the 'iron triangle': Stakeholder perception of key performance indicators (KPIs) for large-scale public sector development projects. *International journal of project management*, 28(3), 228–236. doi:10.1016/j.ijproman.2009.05.005
- Turner R. (1999) *Handbook of project-based management*. 2nd ed. McGraw-Hill.
- Turner, J.R. (2009). *The handbook of project-based management: Leading strategic change in organizations*. McGraw Hill Professional.
- Turner, R. (2015). Re: Project success and stakeholders [Email sent to Kate Davis, 11th March 2015].
- Turner, J.R., Zolin, R., Remington, K., (2009). Modelling success on complex projects: multiple perspectives over multiple time frames. In: Gemuenden, H.-G. (Ed.), *The*

Proceedings of IRNOP9, the 9th Conference of The International Research Network of Organizing by Projects, Berlin, June. Technical University of Berlin, Berlin.

Turner, J.R., Zolin, R., (2012). Forecasting success on large projects: developing reliable scales to predict multiple perspectives by multiple stakeholders over multiple time frames. *Project Management Journal* 43 (5), 87–99.

Turner, J.R., & Xue, Y. (2018). On the success of megaprojects. *International Journal of Managing Projects in Business*.

Van Aken, J. E. (2011). The research design for design science research in management. Eindhoven.

Van den Bossche, P.; Gijssels, W.; Segers, M.; Woltjer, G.; Kirschner, P. (2011). Team learning: building shared mental models, *Instr. Sci.* 39 283–301.

Vandermerwe, S., & Rada, J. (1988). Servitization of business: adding value by adding services. *European management journal*, 6(4), 314-324.

Vargo, S. L., & Lush, R. F. (2004). Evolving a services dominant logic. *Journal of marketing*, 68(1), 1-17.

Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic: continuing the evolution. *Journal of the Academy of marketing Science*, 36(1), 1-10.

Vargo, S.L., Maglio, P.P., Akaka, M.A. (2008). On value and value co-creation: a service systems and service logic perspective. *European Management Journal* 26 (3), 145–152.

Warner, N.; Letsky, M.; Cowen, M. (2005). Cognitive model of team collaboration: macro-cognitive focus, in: *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, Sage Publications, pp. 269–273.

Winch G. (2002) *Managing construction projects*. Blackwell.

Winter M, Szczepanek T. (2008). *Images of projects: pragmatic perspectives for the 21st century*. Gower.

- Xiang, C., Yang, Z., Zhang, L., (2016). Improving IS development teams' performance during requirement analysis in project—the perspectives from shared mental model and emotional intelligence. *Int. J. Proj. Manag.* 34, 1266–1279.
- Yang, H.-D., Kang, H.-R., Mason, R.M., (2008). An exploratory study on meta skills in software development teams: antecedent cooperation skills and personality for shared mental models. *Eur. J. Inf. Syst.* 17, 47–61.
- Yu, X., & Petter, S. (2014). Understanding agile software development practices using shared mental models' theory. *Information and software technology*, 56(8), 911-921.
- Zwikael, O. (2008). "Top management involvement in project management: A cross country study of the software industry", *International Journal of Managing Projects in Business*, Vol. 1 No. 4, pp. 498-511. <https://doi.org/10.1108/17538370810906228>
- Zwikael, O., Smyrk, J., (2012). A general framework for gauging the performance of initiatives to enhance organizational value. *Br. J. Manag.* 23, S6–S22.

APENDIX A

A BIBLIOMETRIC STUDY ABOUT VALUE DELIVERY IN PROJECTS ENVIRONMENT

Abstract

The concept of value delivery by the projects has gained greater relevance in the literature and among practitioners. The value begins to be defined even in the front-end phase of the projects and is effectively realized after the project closure. Since the project's outcome continues to generate value until the end of its useful life, it is recommended that the customer assumes the role of cocreator or co-designer during project execution. As the value can assume negative figures at the back end of the project's outcome, it is necessary to rethink the concept of project success. Aiming to analyze how "value delivery" in the context of projects is covered in the actual literature, citation and cocitation techniques were applied in this bibliometric study. A concentration of studies focused on the front-end of new product development projects is observed. Five thinking lines were detected and are interrelated. New research topics are suggested at the end of this study.

Keywords: Value; Value delivery; Project lifecycle; Bibliometric study; Citation; cocitation

1. Introduction

The Oxford dictionary has two different meanings for “value”: the importance, worth, or usefulness of something; or a person's principles or standards of behavior, one's judgment of what is important in life. In business, Bowman and Ambrosini (2000) define value as the buyer's willingness to pay for the product, or service, based on the benefits it can provide to him.

In the project's environment, much of value concept is founded on the value chain developed by Porter (1985), based on manufacturing and production (Turner, 1999; Grundy & Brwon, 2002; Winch, 2002). According to this concept, the value delivered can be calculated comparing project benefits and project disadvantages, considering the lifecycle of the asset (product or service) generated by the project (Ahola et al., 2008; Zwikael & Smyrk, 2012).

Although traditional problems like missed deadlines, budget overruns, and lack of quality are not solved, since are still widely observed in the projects, the need of a different project management approach has been highlighted (Winter & Szczepanek, 2008). According to the authors, the focus must move towards value and benefits that projects and programs can deliver to organizations, in a stronger strategic approach.

The projects are becoming more multidisciplinary, including areas normally considered secondary, such as marketing and human resources (Normann, 2001). Additionally, the concern with the capital asset has been gradually replaced by the challenge of implementing the business strategy, improving organizational effectiveness, and managing the stakeholders' benefits (Winter & Szczepanek, 2008). The emphasis goes towards a more strategic project management, increasing the integration between the projects with business strategy (Morris & Jamieson, 2004; Brady et al., 2005; Levine, 2005; Ward, 2005).

Looking from this strategic and integrated perspective, delivering the outcome as specified, on time, and increasing value delivery to shareholders is no longer enough to consider a project successful (Cohen & Graham, 2001). The traditional iron triangle, which represents a mentality focused on operational efficiency of “getting the job done” (Dvir et al., 2006) loses prominence. The recommendation is to replace the product (product-centric) by the value (value-centric) as the project's focus, emphasizing the value to be constructed (Zwikael, 2008). Projects and programs are, therefore, getting closer to corporate strategy (Zwikael, 2008; Ramirez ,1993; 1994). Consequently, value creation becomes a new dimension of project success, combined with the traditional iron triangle (cost, time, and scope), and assumes a relevant and central position, becoming the focus of corporate strategy (Ramirez, 1993; 1994).

Instead of just create value to customers, the organizations transform the customers to the main stakeholder of the projects, mobilizing them to create their own values from the

benefits generated by the projects (Normann, 2001). Winter and Szczepanek (2008) go further, proposing a resignification of the business concept, incorporating the customer of the customer (a second level of customer) in the perspective of project success. Thus, the customer is no more a “receiver” of the value delivered by the project, becoming a co-producer and co-designer of value creation.

In this new way of seen the projects, the value delivery continues after the project conclusion through its outcome. As Morris (2013) explain, the value to be generated by a project emerges early in the portfolio management, still in the front-end phase, as an estimation. This value proposition is modified during project execution and is, actually, realized during the operation phase, lasting until the end of the asset’s useful lifetime. Considering this extended lifecycle (Arto et al, 2016), the value can even assume negative figures, as occurs on the nuclear plants or dams decommissioning (Invernizzi et al., 2019).

Arto et al. (2016) considers a system the period between the project’s conception and the retirement of its outcome and call this period “system lifecycle” with successive steps or phases. Integration mechanisms involving the different stakeholders happens between each of these phases when the value can be modified. These transitions between phases are characterized by variable discontinuities depending to the project’s complexity (Locatelli et al., 2020).

The transition between execution to operation in considered important by Locatelli et al. (2020) because the asset generated by the project is transferred to the operation or production. Generally, the project is finished in this transition and its outputs are measured in comparison to what was initially planned. In case of difficulties during the project execution, the manager must prioritize the expected benefits and strategic objectives instead of optimizing the schedule, budget and project quality (Turner, 2008). Thus, the manager's attention is permanently focused on the achievement of strategic objectives, considering the system life cycle, and not only on delivering the value planned at the end of project.

The existing literature, here briefly analyzed, indicates some important issues. Locatelli et al. (2020) recommend analyzing the paradox of project output (short-term results) and organizations' survival and growth strategy (medium- and long-term results). Martinsuo et al. (2019) propose to deepen the understanding of the mechanisms of creation, co-creation, delivery, and capture of value in the extended lifecycle of the project, considering all stakeholders. Questions like the influence of personal values, risks involved, and the level of formalization in the destruction of emergent or unplanned values of the projects may still be unanswered.

Therefore, the concepts related to value creation and value delivery, in the context of projects, become increasingly relevant. It's necessary to go deeper in the understanding of these concepts, helping organizations to really benefit from projects in a medium- / long-term, and not only at the projects closure (very short-term). The comprehension of value creation and value delivery perspectives becomes a key link between projects and corporate strategy.

This situation caused a concern and a wish to map the different approaches realized by the literature, considering value creation and value delivery perspectives in order to explore the subject and go deeper in its comprehension. The understanding of what already exists over the theme will help to identify eventual hiatus still not explored. Based on this concern and wish, the following research question was adopted to guide this paper: **What is the current intellectual structure regarding the concept of "value delivery" in the context of projects?**

To answer the proposed research question, this investigation aims to determine how the literature has approached value delivery in the context of projects so far, with the intention of showing the current "state of the art" in this topic. This central objective was divided in three secondary objectives:

- Identify the works considered references in the topic.
- Identify the different lines of thought from the central topic researched.
- Identify how the different lines of thought are interrelated.

The citation technique brought the list of the most cited works, which mostly talk about the concept phase (front-end) of new products development projects. The exploratory factor analysis was applied, and five different thinking lines appeared.

The deeper understanding of the value stream inside the project environment represents a relevant contribution to practitioners, helping to align projects and corporate strategy. Consequently, it is possible to advance in understanding the effective contribution of projects in the short-, medium- and long-term. The academic contributions are concerned to the relationship between value stream and project success, allowing further discussions about the topic.

This article is structured in five sections, starting in this introduction. Section 2, focused on methodological procedures, presents a brief review of the bibliometric studies applied in this article, as well as an explanation of the data collection and treatment procedures. The results obtained through citation and co-citation analyses are presented in section 3, considering the clustering technique based on multivariate analysis. Section 4 presents the discussion against the initially researched literature. The article is closed in section 5, through

the presentation of conclusions, suggestions for further research and the limitations identified in this research.

2. Research method

Bibliometric studies are based on three main laws (Guedes & Borschiver, 2005): Lotka's law identifies the authors and research centers productivity concerning the researched subject. Usually, few authors emerge by the number of works published within a certain topic. According to Zipf's law, the most relevant terms about a certain topic can be identified by their frequency. Finally, Bradford's law allows estimating journals relevance, as journals can have natural identification with certain knowledge area (Araujo, 2006; Santos & Kobashi, 2009; Guedes & Borschiver, 2005).

The citation and cocitation analysis are founded on these three fundamental laws and performed over the references lists of the articles which form the academic basis of the researched subject, assuming that the most relevant works are more often cited (Neely, 2005). It is possible to localize works and authors with greatest impact through citation analyzes, while the co-citation analysis measures how often two units are cited together (Small, 1973). According to the hypothesis which explains this analysis, the frequency that two documents are mentioned together indicates the relation degree between them.

The sequence adopted in this bibliometric study is presented in Figure 4. The strings adopted in the searches performed in the databases were defined based on the research objectives. After collected, the data were properly deputed and organized to carry out the analyses and interpretation. Finally, the results were compared with the literature to support the conclusions presented at the end of this work.

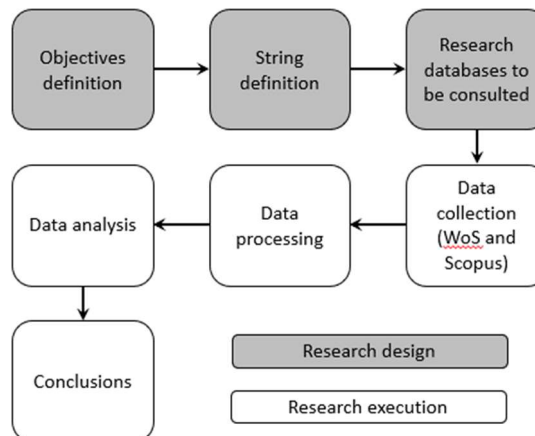


Figure 4 - Research flow

Source: Author

ISI Web of Knowledge (Web of Science) and Scopus databases were chosen due to their relevance and because they normally consolidate traditional journals in the academic environment (Carlos, Serio, & Serio, 2017). Moreover, they are considered the most popular databases for academic research (Archambault, Campbell, Gingras & Lariviere, 2009). The gathering was restricted to articles already published in academic journals because they have a reliable reputation for research due to the methodological rigor required for their publication (Moran et al., 2010).

The key expression was defined based on the value creation, value management and value capture from the deliveries and benefits generated by the projects. According to the literature previously analyzed, it is necessary to consider the system lifecycle proposed by Arto et al (2016). Thus, the four phases described by Arto et al (2016) was considered in the string, as shown in Figure 5.

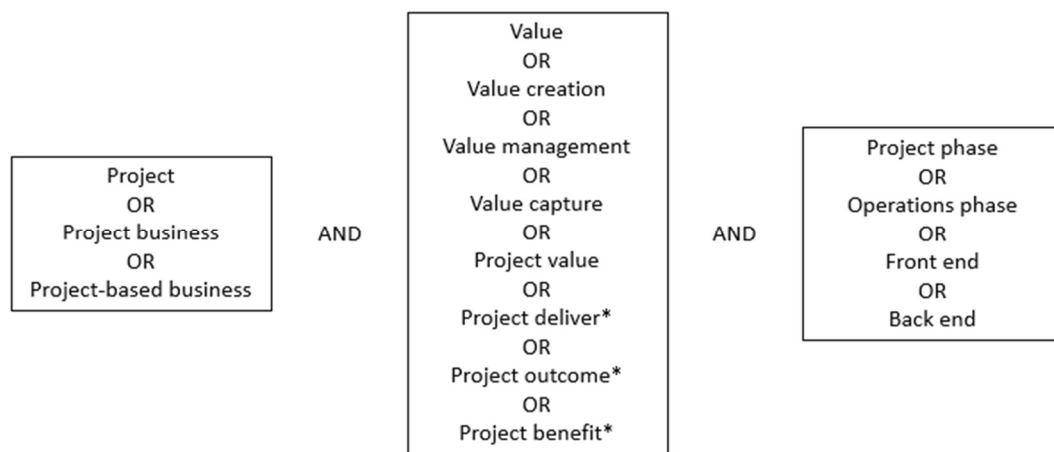


Figure 5 - Search string used in Web of Science and Scopus

Source: Author

The research was carried out focusing on title, abstracts, and keywords, with no limit in terms of publication year. Only complete scientific articles were considered valid. Completing the inclusion conditions, the articles should belong to one of these specific thematic areas: Business, Administration, Computer Science, Energy and Engineering.

3. Results

The data was collected in November of 2021. As the result from Scopus database, 147 articles were obtained, while the WOS database returned 90 articles which fulfilled the

previously defined inclusion conditions. In the second step of data processing, eight articles were excluded because there is no reference list. Then, the lists of articles from the two databases were consolidated and duplicated articles were eliminated, as recommended by Serra et al. (2019). A single list with 178 articles was obtained at the final to proceed to the analysis step, carried out in Bibexcel, targeting to generate the list of the most cited articles and the cocitation matrix. As a result, 8.078 citations were identified in 6.871 cited works.

3.1. Citation

Citation analysis can be used to descriptively reveal intellectual traditions within a given field and trace their development over time (Vogel & Gütel, 2013). As presented in table 1, there is a predominance of studies focused on the concept phase of new projects, known as the front-end (Williams & Samset, 2010; Kim & Wilemon, 2002; Khurana & Rosenthal, 1998; Edkins et al., 2013; Samset & Volden, 2016; Reid & Brentani, 2004). Three other articles address the value creation redefinition within the scope of projects (Laursen & Svejvig, 2016; Winter et al., 2006; Morris, 2013). Finally, Lundin and Söderholm (1995) propose a new theory to support the temporary organizations adopted to run projects, opposed to permanent organizations.

Table 1 - Citation analysis

Number of citations	Citation	Core theme
14	Williams and Samset (2010)	The article explores the issues which can affect the decision-making process in the front-end phase of the projects, considering that the strategic value emerges in this
12	Kim and Wilemon (2002)	The authors suggest 12 strategies to manage the FFE of the product development process in order to reduce its fuzziness level. These strategies have an impact on the overall performance of NPD
11	Khurana and Rosenthal (1998)	The authors analyze the NPD front-end process and argue that a holistic view considering the contextual factors contribute to create a more effective front-end process.
10	Edkins et al. (2013)	The authors discuss the project manager's role on the Front-End phase, concerning the sponsor's role and responsibilities.
10	Samset and Volden (2016)	The authors alert that, in project front-end, it's important to have a good alignment of basic needs of users, project results (outputs), and effects (outcomes) and long term benefits after project conclusion (purpose)
10	Laursen and Svejvig (2016)	The authors studied the project value creation theme through a structured literature review and propose new directions for future research
10	Lundin and Söderholm (1995)	The concept of value emerges as the consequence of the transition to operation. As there are different perceptions of the transformation (or change) among project participants, the transition must focus on individual and/or group behavior ("hard" aspects) or on individual and/or group values ("soft" aspects).
10	Reid and Brentani (2004)	The authors propose a new model of the fuzzy front end of NPD process for discontinuous innovation. Based on this model, the authors argue that the information flow is stimulated by value construction and information sharing.
9	Winter et al. (2006)	The authors propose a research agenda concerning value creation, rather than product creation. Value creation can link projects to business strategy, contributing to revenue maximization and management of benefits delivery to different stakeholders.
9	Morris (2013)	The author suggests a review of project management discipline becoming less inward looking.

Source: Author

3.2. Co-citation

Chavert et al. (2008) argument that selecting the most cited references allows highlighting the list of the most relevant articles. The ideal cut-off point can be defined to find a minimum number of citations, a percentage of the total co-citations found, or a combination of both (McCain, 1990; Acedo & Casillas, 2005; Small & Griffith, 1974). According to Lotka's law, approximately 5% of the total co-citations is representative of the total amount (Nath, & Jackson, 1991). In certain fields of study, 50 references are enough to represent 5% to 10% of the total citations (Vogel & Güttel, 2013). Following these recommendations, items with more than four citations were selected in this study to generate the co-citation matrix in Bibexcel. A total of 106 works were selected, equivalent to 582 citations, or 7.15% of the total, generating a square matrix (106 lines by 106 columns).

Despite of standardization, there are always inconsistencies in the coding used in the database resulted from the different ways that articles are cited (Ramos-Rodriguez & Navarro,

2004). As Bibexcel recognizes only matching sequences of characters, it is recommended to execute a manual adjustment to standardize the references in order to guarantee the accuracy of the results of subsequent analyzes (Ramos-Rodriguez & Navarro, 2004). This fine tuning is normally necessary on author and journal names, and year of publication (Ramos-Rodriguez & Navarro, 2004). Following this recommendation, all 106 references were manually standardized before running the Exploratory Factor Analysis.

3.3. Exploratory Factor Analysis (EFA)

An EFA was executed in SPSS software using the co-citation matrix generated by Bibexcel. AFE is a data reduction technique to create correlations between items and factors (Hair, Black, Anderson, & Tatham, 2005). Based on Scree Plot analysis generated in the first SPSS interaction, a maximum of 5 factors were indicated. Successive interactions were run until commonalities below 0.5 and individual factor loading below 0.5 could be achieved, as recommended by Hair et al. (2005). When cross factor loadings happened, the greater intensity prevailed. Following this criterion 56 citations were kept and divided into 5 factors as shown in Table 2.

Table 2 - Clusters

Citation	Clusters				
	Front-end of NPD projects	Value management	Economic viability in large projects	Project management approaches	Methodological approach in project management research
Griffin (1997)	0,88				
Galbraith (1973)	0,87				
Tushman e Nadler (1978)	0,86				
Brown e Eisenhardt (1995)	0,86				
Tatikonda, et al. (2000)	0,86				
Clark e Fujimoto (1991)	0,86				
Daft e Lengel (1986)	0,84				
Moenaert, et al. (1995)	0,81				
Gupta, et al. (1990)	0,80				
Khurana e Rosenthal (1997)	0,79				
Khurana e Rosenthal (1998)	0,79				
Galbraith (1977)	0,76				
Wheelwright e Clark (1992)	0,74				
Eisenhardt e Tabrizi (1995)	0,73				
Verworn, et al. (2008)	0,72				
Griffin e Page (1996)	0,68				
Pich, et al. (2002)	0,68				
Reid e De Brentani (2004)	0,65				
Smyth, et al. (2018)		0,88			
Artto, et al. (2016)		0,86			
Chang, et al. (2013)		0,86			
Brady, et al. (2005)		0,86			
Martinsuo e Killen (2014)		0,85			
Ahola, et al. (2008)		0,85			
Laursen e Svejvig (2016)		0,80			
Edkins, et al. (2013)		0,79			
Davies (2004)		0,79			
Lepak, et al. (2007)		0,73			
Thiry (2002)		0,68			
Serrador e Pinto (2015)		0,67			
Morris (2013)		0,66			
Winter, et al. (2006)		0,64			
Andersen, et al. (2016)			0,91		
Wachs (1989)			0,91		
Van e Rietveld (2013)			0,89		
Lovallo e Kahneman (2003)			0,88		
Flyvbjerg, et al. (2002)			0,87		
Flyvbjerg, et al. (2003)			0,85		
Samset e Volden (2016)			0,82		
Ahola, et al. (2014)			0,82		
Biesenthal, et al. (2014)			0,82		
PMI, (2017)			0,73		
Flyvbjerg (2009)			0,66		
Simon (2006)				0,84	
Lindkvist, et al. (1998)				0,81	
Lenfle e Loch (2010)				0,72	
Lundin e Söderholm (1995)				0,66	
Collyer e Warren (2009)				0,65	
Blomquist, et al. (2010)				0,64	
Williams, et al. (2009)				0,63	
Morris (1994)				0,63	
PMI, (2008)				0,58	
Glaser e Strauss (1967)					0,82
Eisenhardt (1989)					0,80
Yin (1994)					0,77
Veryzer (1998)					0,76

Source: Author

The five factors resulted from EFA explained 69,5% of the total variance, with a KMO index of 0,782, considered acceptable. Each of the 5 factors reliability was tested using Cronbach's evaluation and passed as resulted greater than 0,7, as recommended by Hair et al. (2005) for exploratory analyzes. The reliability of the factors was also considered approved as resulted above the limit of 0,7, concerning the Composite Reliability (CR) index, as

recommended by Wetz et al. (1974). All the factors resulted 0,5 of Average Variance Extracted (AVE) test as well, as recommended by Fornell and Larcker (1981). The summary of these analysis is presented in Table 3.

Table 3 - Reliability analysis

Clusters	Front-end of NPD projects	Value management	Economic viability in large projects	Project management approaches	Methodological approach in project management research	Total	Reference
Citations	18	14	11	9	4	56	
Explained variance	30,9	14,0	11,4	7,7	5,6	69,5	
Cronbarch's Alfa	0,97	0,95	0,96	0,86	0,88		> 0,7
Average Variance Extracted (AVE)	0,6	0,6	0,7	0,5	0,6		> 0,5
Confiabilidade composta (CR)	1,0	1,0	1,0	0,9	0,9		> 0,7

Source: Author

The deeper analysis of all the articles is summarized in the five factors presentation.

3.3.1 Factor 1: Front-end of new products development projects (NPD)

Factor 1 is concerned on great influence of the concept phase (front-end) of New Product Development (NPD) projects on the projects' results. According to Khurana and Rosenthal (1997; 1998), the success or failure of a new product can be defined in this phase.

Different approaches to manage the projects' front-end are discussed in this factor. Griffin (1997) argues that the use of cross-functional teams shortens new product development cycle time and Tushman and Nadler (1978) suggest a contingency-based approach to create structural alternatives to deal with the uncertainties, usually involved in NPD projects.

Innovation projects typically involve a greater level of ambiguity and variability at this initial phase. Verworn, et al. (2008) argue that the level of uncertainty in this phase is proportional to the disruption involved and suggest prioritizing the reduction of those uncertainties concerned on the market and on the technical issues. More focused on procedures, Eisenhardt and Tabrizi (1995) suggest intensifying iterations and tests, adopting frequent project milestones and cross-functional teams to shorten the lifecycle of this type of project in order to increase the benefits generated.

Another group of authors put more emphasis on customers and on the market in their approaches. Gupta and Wilemon (1990) discusses the leadership role in NPD projects based on the value they represent to customers. Khurana and Rosenthal (1997) argue that the approach to be adopted in this phase must be compatible with the characteristics of the market, the product to be delivered, and the organization. In another article, Khurana and Rosenthal (1998) recommend an approach that encourages a more active participation of the team, focusing on customer and business.

3.3.2. Factor 2: Value management

In this cluster, the authors discuss the value creation, generation, cogeneration, and management within the projects. Morris (2013) explains that it is necessary to act in the context in which projects and programs are formed and implemented in order to increase the value to be provided to sponsors. Davies (2004), on the other hand, studied how key suppliers try to offer integrate services and products in order to provide a complete solution to their customers, increasing the value delivered. Edkins, et al. (2013) suggest that it is possible to increase the delivered value to the customers through a more strategic participation of project managers in the front-end.

Laursen and Svejvig (2016) reviewed the literature about value management and propose four directions for new research: 1) Re-signification of value management through the combination of value, benefits, and costs; 2) Value capture complementing value creation; 3) Holistic approach to project, portfolio and strategic management; and 4) Independent application of models and frameworks to create new theories.

3.3.3. Factor 3: Economic viability in large projects

According to the literature, there is a general tendency to underestimate the costs and overestimate the benefits to facilitate project approval in front-end phase. This behavior tends to be more critical in infrastructure projects because the cost-benefit analysis tends to be less reliable while the cost escalation is proportional to the implementation cycle time and to the budget involved (Flyvbjerg, 2009).

This systematic and selfish practice of artificially improve the cost-benefit rate adopted to facilitate project's approval turns infrastructure projects extremely risky (Flyvbjerg et al., 2003). This manipulation to make projects looking better on paper normally accumulate big overspending and benefit deficits, generating scandals, very common in large investments in infrastructure projects (Flyvbjerg, 2009). Despite the natural connection between infrastructure projects and public organizations, this problem is also present in private organizations, contrary to popular belief (Flyvbjerg et al., 2002).

Contributing to the problem solution, Lovallo and Kahneman (2003) propose a model to support the economic viability analysis of new projects based on lessons learned in previous projects. This way it is possible to avoid cognitive biases and pressure for positive outcomes which could cause accentuation of the expected benefits and costs underestimation.

The result of the economic feasibility analysis has a large influence on the decision to go ahead or to abort a project in the front-end. Samset and Volden (2016) studied the strengths

and weaknesses of the decision-making processes included in project governance in this preliminary stage. Ahola, et al. (2014) argues that project governance defines and directs the way project, program and portfolio managers execute their work.

3.3.4. Factor 4: Project management approaches

Different approaches on project management are discussed in this factor. Simon (2006) proposes a less “administrative” approach of the project manager in creative projects. Lindkvist, et al. (1998) argue that it is possible to shorten the development time of new products in high technology companies if managers take some preventive actions: a) adopt deadlines as a mechanism of control; b) promote cross-functional cooperation; and c) promote the parallelism of project activities instead of the waterfall configuration (sequential execution of the activities). Complementing, Williams, et al. (2009) discuss the lack of information impact in the decision-making process, concerning large projects front-end.

In a different point of view, a discussion is performed comparing the literature and the real world. The effective actuation of practitioners managing their projects is compared with the approach given by the literature on project management practices. Morris (1994) proposes changes in project management towards more practical approaches, while Blomquist, et al. (2010) propose the construction and adaptation of theories and models based on the understanding of procedures adopted in project management by practitioners. Being more specific, Lundin and Söderholm (1995) argue that a theory about temporary organizations based on "Action" is necessary, considering the time in the center of project management, concerning the relationship between tasks, team and transitions between phases.

3.3.5. Factor 5: Methodological approach in project management research

The fifth cluster is formed by four articles, which are concerned on research methodology applied on studies about value delivery topic. Yin is a reference for case studies, while Eisenhardt is a reference in theory building based on case studies. Glaser and Strauss (1967) deal with the theories creation or adaptation from empirical situations. Finally, in the fourth article of this cluster, Veryzer (1998) studies management practices associated with disruptive innovations and suggests a theoretical model for product development projects generated from radical innovations.

Case studies and theory building are common points between these authors, which indicates a predominance of qualitative studies, notably case studies, in the literature here analyzed. This can be an indicative sign that the studies about value management are still

focused on specific situations, disclosing a gap in the literature about the topic concerning research methodological approach.

4. Discussion

Both citation and cocitation analysis indicated a predominance of articles focused on the front-end phase of NPD projects. Value management and project management approaches complete the list of topics covered by the analyzed literature in this paper. Since there is a need to review project management practices to become more suitable to the new paradigm of value management, these topics are interrelated.

Another thinking line is more focused in the biases present in the economic viability studies, mainly in large projects of infrastructure. As the investment amount involved in this type of project is high and they can cause big damages when are not successful, this thinking line is critical and deserve special attention. The biases normally turn the projects more attractive, lightning their benefits and reducing their costs. This practice distorts the value proposition and affect the selection of projects during the front-end phase, compromising the project results and the company strategy. The results of this bibliometric study highlight Flyvbjerg as a prominent author in this topic due to the number of articles already published by him about the topic.

Cluster 5 is focused on the methodological approach given by the literature to value delivery by projects. Although there are only four articles in this cluster, it is an indication that the “value delivery” has been discussed predominantly through case studies. Thus, the present literature about the topic seems to be based on punctual and specific empirical analysis. Most of the models and frameworks proposed and applied by the literature seems to be more focused on practices effectively used by practitioners. Therefore, new discussions on the concepts and practices of project management and, mainly, of value management, will be necessary once the value generated by the projects has gradually assumed a more prominent position when approaching the strategic issues of the companies.

Consequently, the performance of project managers also needs to be reviewed and adapted to these conceptual changes. Issues like including project managers in the front-end of the projects and the concern with the system lifecycle of projects' outcomes must be broadly discussed by the literature. Project managers must adapt their mindsets to the new reality of value-centric projects, being more strategic in their decisions looking for medium- and long-term results, concerning the benefits to be generated based on the customer's needs and wishes.

5. Conclusions

A list of the most cited works, concerning value delivery in projects, was presented as the result of the citation technique. This is not mean necessarily that these are the most prominent works in the topic, but they are important as are frequently cited by other authors. The focus is on the front-end phase, particularly on NPD projects. Additionally, five different thinking lines (clusters) emerged from the cocitation analysis, representing the actual intellectual structure that address the value delivery in the context of projects: Front-end of NPD projects; Value management; Economic viability in large projects; Project management approaches; and Methodological approach in project management research.

Value delivery is one step of the value stream, which emerges as a result of the changes currently in progress in project management field. According to the new paradigm in project management, the value assumes a central position, requiring more attention and a review in the project management approaches. As asserted by the literature, the value proposal emerges in the front-end phase of the projects, which can partially explain why this topic is so studied by the literature. At the end of front-end phase, pre-projects can be approved to go ahead, be canceled or postponed, depending on the results of the economic viability studies. Biased estimations can distort the value initially proposed, compromising the value to be delivered and, consequently, the project results.

The points discussed in this paper represent the current picture of the actual intellectual structure regarding the concept of “value delivery” in the context of projects, answering the research question initially proposed to this study. The initial objectives established in this study are also achieved by the results of the bibliometric study through the application of citation and cocitation techniques.

The concept of value is advancing in terms of importance, influencing the results of the projects, but many gaps remain opened and new ones were identified by this research. The paradox between the short- and long-term results generated by the projects is not yet totally explained by the literature and claims for further discussions. Studies focused on topics such as creation, cocreation, delivery and capture of value in the execution phase and post-completion of projects were also little addressed by the literature. The same conclusion can be done concerning the transitions between system lifecycle phases. The understanding of the customer’s needs remains superficial and a source of residual risks which can jeopardize the project results.

Future studies can address practices to support project managers during the execution phase, mainly on the decision-making process based on stakeholders' perceptions of value delivery. The same can be said concerning on how to include the customer in the cocreation process based on the benefits to be generated by the project. The transition between execution and operation phases is a critical moment on the system lifecycle and deserves attention from researchers as well. Finally, the bias on economic viability studies is probably not restricted to large projects and should be studied in small projects due to its consequences on the value creation and on the project results.

Bibliometric studies have their intrinsic limitations, not promoting a deeper analysis of the articles. Thus, a further deeper and systematic literature review on the articles from each of the thinking lines here identified can add further understanding and bring new insights. Another limitation of this study is concerned on the identification of the literature network formed by the authors which study value delivery in projects environment. The construction of the cocitation network from the matrix generated by Bibexcel would provide a better understanding on the relationships between the authors, allowing a broader understanding of the intellectual structure. Finally, the identification of tendencies within the topic here analyzed is not part of the objectives of this study, which can be considered a limitation.

References

- Acedo, F. J., & Casillas, J. C. (2005). Current paradigms in the international management field: An author co-citation analysis. *International Business Review*, 14(5), 619-639.
- Ahola, T., Laitinen, E., Kujala, J., Wikström, M., K. (2008) Purchasing Strategies and Value Creation in Industrial Turnkey Projects. *Int. J. Proj. Manag.*, 26 (1), Pp. 87-94, Doi 10.1016/J.Ijproman.2007.08.008
- Ahola, T., Ruuska, I., Artto, K., Kujala, J. (2014) What Is Project Governance and What are its Origins? *International Journal of Project Management*, 32 (8), Pp. 1321-1332, Doi 10.1016/J.Ijproman.2013.09.005
- Araujo, C.A. (2006). Bibliometria: evolução histórica e questões atuais. *Em Questão*, Porto Alegre, v. 12, n. 1, p. 11-32, jan./jun. 2006
- Artto, K., Ahola, T., Vartiainen, V. (2016) From the Front End of Projects to the Back End of Operations: Managing Projects for Value Creation Throughout the System Lifecycle *International Journal of Project Management*, 34 (2), Pp. 258-270
- Blomquist, T., Hägglén, M., Nilsson, A., Söderholm, A. (2010) Project-As-Practice: In Search of Project Management Research That Matters. *Project Management Journal*, 41 (1), Pp. 5-16
- Brady, T., Davies, A., Gann, D.M. (2005) Creating Value by Delivering Integrated Solutions. *International Journal of Project Management*, 23 (5), Pp. 360-365. <https://doi.org/10.1016/J.Ijproman.2005.01.001>
- Bowman, C., Ambrosini, V. (2000). Value creation versus value capture: Towards a coherent definition of value in strategy. *Br. J. Manag.* 11 (1), 1–15.
- Charvet, F., Cooper, M., & Gardner, J. (2008). The intellectual structure of supply chain management: A bibliometric approach. *Journal of Business Logistics*, 29(1), 47-73.
- Cohen D, Graham R. (2001). *The project manager's MBA*. Jossey-Bass.
- Davies, A. (2004) Moving Base into High-Value Integrated Solutions: A Value Stream Approach. *Ind. Corp. Chang.*, 13 (5), Pp. 727-756 Doi 10.1093/Icc/Dth029
- Edkins, A., Geraldi, J., Morris, P., Smith, A. (2013) Exploring the Front-End of Project Management. *Engineering Project Organization Journal*, 3 (2), Pp. 71-85 Doi 10.1080/21573727.2013.775942
- Eisenhardt, K.M., Tabrizi, B.N. (1995) Accelerating Adaptive Processes: Product Innovation in the Global Computer Industry. *Administrative Science Quarterly*, 40, Pp. 84-110
- Flyvbjerg, B., Bruzelius, N., Rothengatter, W. (2003) *Megaprojects and Risk. An Anatomy of Ambition*, Cambridge University Press, Cambridge

- Flyvbjerg, B., Holm, M.S., Buhl, S. (2002) Underestimating Costs in Public Works Projects: Error or Lie? *J. Am. Plann. Assoc.*, 68 (3), Pp. 279-296, 0194-4363, 10.1080/01944360208976273
- Flyvbjerg, B. (2009) Survival of the Unfit test: Why the Worst Infrastructure Gets Built “and What we can do About it. *Oxford Review Of Economic Policy*, 25 (3), Pp. 344-367
- Fornell, C., Larcker, D.F., (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research* 18 (1), 39–50.
- Glaser, B.G., Strauss, A.L. (1967) *The Discovery of Grounded Theory: Strategies for Qualitative Research*, Chicago: Aldine
- Griffin, A. (1997) PDMA Research on New Product Development Practices: Updating Trends and Benchmarking Best Practices. *Journal Of Product Innovation Management*, 14 (6), Pp. 429-458
- Grundy T, Brown L. (2002) *Strategic project management*. Thomson Learning.
- Guedes, V. L., & Borschiver, S. (2005). Bibliometria: uma ferramenta estatística para a gestão da informação e do conhecimento, em sistemas de informação, de comunicação e de avaliação científica e tecnológica. *Encontro Nacional de Ciência da Informação*, 6(1), 18.
- Gupta, A.K., Wilemon, D.L. (1990) Accelerating the Development of Technology-Based New Products. *California Management Review*, 32, Pp. 24-44, Doi 10.2307/41166603
- Hair, J.F., Black, Anderson, R.E., & Tatham, R.L. (2005). *Análise Multivariada de Dados*. Bookman.
- Invernizzi, D.C., Locatelli, G., Gronqvist, M., Brookes, N. (2019). Applying value management when it seems that there is no value to be managed: the case of nuclear decommissioning. *Int. J. Proj. Manag.* 37 (this issue).
- Khurana, A., Rosenthal, S.R. (1997) Integrating the Fuzzy Front End of New Product Development. *Sloan Management Review*, 38 (2), Pp. 103-120
- Khurana, A., Rosenthal, S.R. (1998) Towards Holistic “Front End”™ In New Product Development. *Journal Of Product Innovation Management*, 15 (1), Pp. 57-74
- Kim, J., Wilemon, D. (2002) Strategic Issues in Managing Innovation'S Fuzzy Front-End. *European Journal of Innovation Management*, 5 (1), Pp. 27-39
- Laursen, M., Svejvig, P. (2016) Taking Stock of Project Value Creation: A Structured Literature Review with Future Directions for Research and Practice. *International Journal of Project Management*, 34 (4), Pp. 736-747, Doi 10.1016/J.Ijproman.2015.06.007
- Levine H. (2005) *Project portfolio management*. Jossey-Bass.

- Lindkvist, L., Soderlund, J., Tell, F. (1998) Managing Product Development Projects: On the Significance of Fountains and Deadlines. *Organization Studies*, 19 (6), Pp. 931-951
- Locatelli, G.; Zerjav, V.; Klein, G. (2020). Project Transitions—Navigating Across Strategy, Delivery, Use, and Decommissioning. *Project Management Journal*, Vol. 51(5) 467–473
DOI: 10.1177/ 8756 9728 20953976
- Lovullo, D., Kahneman, D. (2003) Delusions of Success: How Optimism Undermines Executives' Decisions. *Harvard Business Review*, Pp. 56-63, (July Issue)
- Lundin, R.A., Söderholm, A. (1995) A Theory of the Temporary Organization. *Scandinavian Journal of Management*, 11 (4), Pp. 437-455, Doi 10.1016/0956-5221(95)00036-U
- Martinsuo, M., Klakegg, O.J., Marrewijk, A. (2019) Editorial: Delivering value in projects and project-based business, *International Journal of Project Management*, Volume 37, Issue 5. Pages 631-635, ISSN 0263-7863, <https://doi.org/10.1016/j.ijproman.2019.01.011>.
(<http://www.sciencedirect.com/science/article/pii/S0263786319300900>)
- McCain, K. W. (1990). Mapping authors in intellectual space: A technical overview. *Journal of the American Society for Information Science*, 41(6), 433.
- Morris, P.W.G. (1994) *The Management of Projects*. London, UK: Thomas Telford Services Ltd
- Morris P, Jamieson A. (2004) Translating corporate strategy into project strategy. *Project Management Institute*.
- Morris, P.W.G. (2013) Reconstructing Project Management Revisited: A Knowledge Perspective. *Project Management Journal*, 44 (5), Pp. 6-23, Doi 10.1002/Pmj.21369
- Nath, R., & Jackson, W. M. (1991). Productivity of management information systems researchers: does Lotka's law apply? *Information Processing & Management*, 27(2-3), 203-209.
- Normann R. (2001) *Reframing business: when the map changes the landscape*. Wiley.
- Porter M. (1985) *Competitive advantage*. Free Press.
- Ramos-Rodríguez, A. R., & Ruíz-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.
- Reid, S.E., De Brentani, U. (2004) The Fuzzy Front End of New Product Development for Discontinuous Innovations: A Theoretical Model. *The Journal of Product Innovation Management*, 21, Pp. 170-184

- Samset, K., Volden, G.H. (2016) Front-End Definition of Projects: Ten Paradoxes and Some Reflections Regarding Project Management and Project Governance. *Int. J. Proj. Manag.*, 34, Pp. 297-313
- Santos, R. N. M. dos, & Kobashi, N. Y. (2012). Bibliometria, cientometria, infometria: conceitos e aplicações. *Pesquisa Brasileira em Ciência da Informação e Biblioteconomia*, 5(1). Recuperado de <http://periodicos.ufpb.br/ojs/index.php/pcbic/article/view/11992>
- Serra, F. A. R., Cirani, C. B. S., & da Assunção Moutinho, J. (2019). Dicas sobre Estudos Bibliométricos Dúvidas Frequentes Relacionadas ao Comentário Editorial Doing Bibliometric Reviews for the Iberoamerican Journal of Strategic Management-RIAE 17 (3), pp. 1-16 (2018). *Revista Ibero-Americana de Estratégia*, 18(3), 01-08.
- Simon, L. (2006). Managing creative projects: an empirical synthesis of activities *International Journal of Project Management*, 24 (2), pp. 116-126
- Small HG. (1973). Co-citation in the scientific literature: a measure of the relationship between two documents. *Journal of the American Society for Information Science* 24: 265–269.
- Small HG, Griffith BC. (1974). The structure of scientific literature: identifying and graphing specialties. *Science Studies* 4: 17–40.
- Turner R. (1999) *Handbook of project-based management*. 2nd ed. McGraw-Hill.
- Verworn, B., Herstatt, C., Nagahira, A. (2008) The Fuzzy Front End of Japanese New Product Development Projects: Impact on Success and Differences Between Incremental and Radical Projects. *R&D Management*, 38 (1), Pp. 1-19
- Veryzer, R.W. (1998) Discontinuous Innovation and the New Product Development Process. *Journal of Product Innovation Management*, 15 (4), Pp. 304-21
- 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.
- Werts, C.E., Linn, R.L., Joreskog, K.G., 1974. Intraclass reliability estimates: testing structural assumptions. *Educational and Psychological Measurement* 34 (1), 25–33.
- Williams, T., Samset, K. (2010) Issues in Front-/End Decision-Making on Projects. *Project Management Journal*, 41 (2), Pp. 38-49, Doi 10.1002/Pmj.20160
- Williams, T., Samset, K., Sunneva G, K.J. (2009) Making Essential Choices with Scant Information - Front-End Decision Making in Major Projects, *Series Making Essential Choices With Scant Information - Front-End Decision Making In Major Projects*, (Eds.), Palgrave Macmillan, Basingstoke
- Winch G. (2002) *Managing construction projects*. Blackwell.

- Winter, M., Smith, C., Morris, P., Cicmil, S. (2006) Directions for Future Research in Project Management: The Main Findings of a Uk Government Funded Research Network. *International Journal of Project Management*, 24 (8), Pp. 638-649
- Winter M, Szczepanek T. (2008). *Images of projects: pragmatic perspectives for the 21st century*. Gower.
- Yin, R.K. (1994) *Case Study Research: Design and Methods*, 2Nd Ed. Sage Publications London
- Zwikael, O. (2008). "Top management involvement in project management: A cross country study of the software industry", *International Journal of Managing Projects in Business*, Vol. 1 No. 4, pp. 498-511. <https://doi.org/10.1108/17538370810906228>
- Zwikael, O., Smyrk, J. (2012) A General Framework for Gauging the Performance of Initiatives to Enhance Organizational Value. *British Journal of Management*, 23 (S1), Pp. 6-22, Doi 10.1111/J.1467-8551.2012.00823.X

APENDIX B

UNDERSTANDING THE STAKEHOLDER'S DIFFERENT PERCEPTIONS OF VALUE REALIZATION BY PROJECTS THROUGH THE MENTAL MODELS THEORY

Abstract

The main objective of a project is to create value to all stakeholders through the benefits generated by its outcomes. As value can assume tangible or intangible forms and projects involve many stakeholders, the perception of the value realized by the projects are different among the multiple stakeholders and can change over the time. This paper confirms, through a survey with 183 Brazilian practitioners, that there are similarities and differences concerning the perceived value realized among executives, project managers, project team and project recipients. These different perceptions are based on the individual cognitive process, named mental models. As a team is formed by multiple individuals, there are multiple individual mental models living together simultaneously. Thus, a unique understanding about same facts is hardly achieved, but similar perceptions can be developed by shared mental models.

Keywords: Stakeholder perception gap; Mental models theory; Value realized; project success.

1. Introduction

The perception of project performance is moving from operational/functional nature towards a more strategic focus (Toor & Ogunlana, 2010). Projects are no more seen as means to survival, but as powerful strategic weapons to enhance competitiveness and create value for stakeholders in general (Shenhar, 2004).

Nonetheless, the most appropriate way to measure the project success is not a consensus and there is an important perception gap in the project success assessment. Davis (2014) organized the stakeholders in three groups (senior management, project core team, and project recipients) and detected a strong perception gap among them in terms of project success definition in the literature. Based on this result, the author recommends that the project management should promote a better alignment of stakeholders' perceptions through the establishment of factors to be used in success assessment.

It may be common knowledge that project stakeholders do not agree among themselves and have different perceptions about the same facts. Gaps can appear in the very early stages of the projects, during the understanding of the customer's requirements (Stork & Sapienza, 1995; Jiang et al., 2002). Jiang et al. (2009) argue that the perception gap is influenced by requirements diversity and instability. These perception gaps normally generate residual risks, which compromise the project performance. Thus, the stakeholder's perception gaps can affect not just the project outcome but also its output, due to risks not properly controlled (Jiang et al., 2009).

The gap between different perceptions is a complex result of social shaping because it is the consequence of the different backgrounds of the multiple stakeholders (Davidson, 2002). Johnson-Laird (1980) affirms that individuals' experiences, perceptions, and understandings of the world are the base of a construct named mental model.

Johnson-Laird (1980) argues that perception and linguistic comprehension yields a mental model, and the reasoning are the internal manipulations of mental models that individuals do to anticipate the world and make sensible decisions about what to do. Peter Senge (1990) considers mental models important due to its focus on the openness needed to unearth shortcomings in our present ways of seeing the world. He explained that "mental models are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take actions" (p56).

Mental models' theory has already been analyzed by project management scholars. General systems theory suggest that managers interact with projects through decision models, or mental models, to take their managerial decisions (Forrester, 1961; Sterman, 2001). Thus, a

better understanding of the levels of complexity and uncertainty of a certain situation allows project managers to better adapt their decision-making approach and maximize performance of their projects (Daniel & Daniel, 2018). Yu and Petter (2014) used shared mental models' theory as a lens to explain how agile practices application increases collaboration within project team and among developers and customers. Thus, the project team can improve its ability to better adapt to customer's changing requirements, leading to better project outcomes.

Toor and Ogunlana (2010) propose to leave the frameworks of project performance measurement more comprehensive including a subjective and qualitative criterion. Modern needs, future demands, and stakeholders' expectations must be incorporated into an inclusive index that can explain if the project is successful, according to the authors.

In our point of view, this perception gap between different stakeholders must be deeply investigated and better understood in order to detect the reasons that leave to this situation. Moreover, if project performance measurement must incorporate a more strategic focus, as proposed by Toor and Ogunlana (2010), the stakeholder's perception of the value realization by the projects shall be better understood by project managers. The benefits provided by the project's outcome is the baseline for determining the value offered and the perception of value realized, ultimately, is the baseline to determine the project success.

Based on above contextualization, this paper proposes to adopt mental models and shared mental models as theoretical lens to investigate and understand the stakeholder's different perceptions about value realization. The following research question instigate our curiosity and must be answered at the end of this research: **Does different groups of stakeholders of a project have the same perception about the value realized by the outcome of the project?**

To answer this question, this paper considers initially the three groups of stakeholders proposed by Davis (2014): senior management, project core team, and project recipients. It is assumed, as a premise, that each of these groups have naturally different perceptions about the value realized by the project as a result of their individual mental models. Based on this premise, the main objective of this research is divided in the following secondary objectives:

- Confirm that there is uniformity of perception inside each group of stakeholders concerning the value realized by the project's outcome.
- Confirm that the perceptions of the three groups of stakeholders are different from each other concerning the value realized by the project's outcome.

- Explain, through mental models' and shared mental models' theories, the similarities and differences detected in the perceptions of the three groups of stakeholders concerning the value realized by the project's outcome.

To confirm this assumption, a survey was answered by 183 Brazilian practitioners, representants from the groups proposed by Davis (2014). As contributions to practitioners, the understanding of the perception gaps between multiple stakeholders will help project managers to improve their decision-making process and will give them subsidies to enhance the outputs and outcomes of their projects. Consequently, the projects will be able to offer higher value to stakeholders.

The academic contribution includes advancing in some theoretical studies, deeper the understanding on stakeholder's perceptions and propose the use of theories based of human cognition process to explain stakeholder's behaviors. Moreover, the understanding of value perception gaps can help in the project success discussion, mainly concerning the benefits provided by project's outcomes and the assessment in short-, medium- and long-term view.

This article is structured in the following way: The following section presents a theoretical background review about stakeholder's perception gap in value realized and mental models' theory. Section 3 deals with the research method used to achieve the goals of this research. The data is analyzed on section 4 and the results are presented in section 5. The discussion considering the current literature is done in section 6. To close the paper, the conclusions are presented in section 7, while limitations, contributions and further studies are in the section 8.

2. Theoretical background

This section does not have the objective of covering all the available literature about the themes here discussed. The objective here is to present a theoretical background sufficient to ground the discussions over the results obtained in the field research.

2.1. Stakeholder's perception gap of value realized

The perception gap between multiple stakeholders has many implications in the project management field. The different perceptions can explain why users and Information Systems (IS) developers have difficult to achieve the mutual understanding necessary to accomplish the goals of the project (Daft & Lengel, 1986). Closing this gap can be even more difficult because it can be originated in requirements specification (Jiang et al., 2009), which is often

characterized as an ongoing chaotic, nonlinear, and continuous sense-making process among stakeholders (Curtis et al., 1988; Walz et al., 1993; Newman & Robey, 1992; Davidson, 2002).

Some authors argue that an additional early source of risk in projects is the presence of a gap in understanding between users and developers (Cleland & Ireland, 2006; Klein et al., 2001; Schwalbe, 2007). Jiang et al. (2009) affirm that a residual performance risk includes the lingering uncertainties that the chosen reduction strategy does not mitigate. If not properly managed, residual risks can impact project success, both outputs and outcomes (Jiang et al., 2009).

Galbraith (1973) explains “uncertainty” as the knowledge gap between what is required and what users have at any given time. Thus, the perception gaps between what is really realized by the projects and what should be realized is a source of customer’s dissatisfaction and can impact project success. This means that users and developers should achieve a common understanding of the purpose of a project and the measures by which the project will be deemed a success (Jiang et al., 2009).

There are important perception gaps on project success evaluation by different stakeholders as well. Each stakeholder sees the result of a project differently (Cox et al., 2003) because they normally have distinct vested interests in each project (Bryde & Brown, 2005). Consonance theory argues that project managers must attempt to reach a common understanding among stakeholders on the project objectives, scope, and success criteria (Klein & Jiang, 2001).

Cox et al., 2003 divide the project success measurement in qualitative (intangible) and quantitative (tangible) and argues that the qualitative indicators are not so reliable because are difficulty to be perceived and measured. To turn the project success assessment more complex, different participants think differently while analyzing the performance of a project (Cox et al., 2003), creating some ambiguity.

Lim and Mohamed (1999) divide project success in two viewpoints: the micro-level and macro-level. While micro-level is related to the traditional iron tringle (time, budget and according to the specifications), the macro-level is usually evaluated by the end users and project beneficiaries, according to their need’s satisfaction and benefits realization. End users are usually worried if the output of the project is working properly and with the long-term gains of the project (Lim & Mohamed, 1999). Thus, micro success means profitability or short-term gains, while macro success is concerned with long-term gains, realized by the outcome of the project (Toor & Ogunlana, 2010).

Davis (2014) listed nine different success factors from the literature and detected that quality is relevant only to the project manager and the client/user. Quality, in this case, is defined as the perceived stakeholder satisfaction or, in other words, the user, consumer and customer needs satisfaction (Jugdev & Müller, 2005; Lim & Mohamed, 1999; Munns & Bjeirmi, 1996; Tishler et al., 1996; Tukul & Rom, 2001; Turner, 2009; Wateridge, 1998).

The delivery of strategic benefits by the project is another success factor considered in the research of Davis (2014), but relevant only to the project manager and the sponsor of the project. On the other side, executives are concerned only with project objectives agreement and top management support/commitment (Davis, 2014).

Thus, it is possible to assume that there is an important influence of the stakeholder's perception on the recognition of the value realized by projects, represented by the satisfaction of user's needs and sponsor's goals. Bryde and Brown (2005) propose including the overall satisfaction of stakeholders in project performance evaluation criteria, as projects are growingly seen as a powerful strategic weapon to create value for their clients and other stakeholders, among other things (Shenhar, 2004).

Toor and Ogunlana (2010) argue that the frameworks of project performance measurement need to become more comprehensive and include subjective and qualitative criteria, over the more traditional quantitative and objective criteria. The authors propose incorporating stakeholders' expectations on the frameworks to become more comprehensive. According to them, despite the fact that the various stakeholders have substantially different perception for traditional key performance indicators, such as schedule, budget, and scope, they tend to agree on most qualitative measure of project performance.

Complementing a more comprehensive view for evaluating the success of a project, Davis (2014) proposes to include additional stakeholders' groups, as all of them need to be satisfied with the project besides the project manager and the customer. According to the author, project success tends to be evaluated based on the project manager perception. It is rarely evaluated across multiple stakeholders' groups. As all business departments of an organization expect to gain value from a project, they must be included on the project success evaluation (Davis, 2014). The author proposes joining the different stakeholders into three main groups: senior management, project core team and project recipients.

Thus, based on strong literature support about stakeholder's perception gap of value realization, it was hypothesized that:

H1: The three main groups of stakeholders (senior management, project core team and project recipients) have different perceptions of value realized by projects.

2.2. Mental models' theory

Mental models are conceived of a cognitive structure that forms the basis of reasoning, decision making, and behavior (Johnson-Laird, 1980). They are constructed by individuals, based on their personal life experiences, perceptions, and understandings of the world (Johnson-Laird, 1980). In other words, mental models are cognitive representations of external reality (Jones et al., 2011).

The psychologist Kenneth Craik (1943) originally postulated the notion of mental model proposing that individuals carry a small-scale model of how the world works in their minds, and use these personal small models to anticipate events, reason, and form explanations. Some decades later, Johnson-Laird (1980) proposed the mental model's theory as a reasoning mechanism that exists in a person's working memory. Later, in 1986, Johnson-Laird expanded his own theory arguing that individuals learn new knowledge and solve problems based on their abstract representation of physical world.

Other authors also advanced in the understanding of mental models. Jones et al. (2011) concluded that individuals make use of their mental models, as cognitive representations of external reality, to structure their reasoning in the decision-making process. More recently, Gray et al. (2014) highlighted that individual uses the cognitive representations as heuristic devices to support the acquisition of knowledge incrementally overcoming the limitations of human cognition under conditions of complexity and uncertainty.

Based on the mental model's theory from Johnson-Laird (1980), Cannon-Bowers and Salas (1993) proposed the shared mental model's theory considering a team as a unified information processing unit. The authors defined shared mental models as the "knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task, and, in turn, to coordinate their actions and adapt their behavior to demands of the task and other team members" (p. 228). Thus, shared mental models provide the team with an internal knowledge base that allows the members to decide what actions to take when novel events happen, maintaining a shared understanding within the team (Cannon-Bowers & Salas, 1993). Consequently, teams rely on essential cognitive processes to build shared mental models (McComb, 2007; Warner et al., 2005; Van et al., 2011).

Mental model theorists involved in organizational research take a particular interest in the development of "collective or shared" mental models as a way of enhancing team performance (Langan-Fox et al. 2000, 2001). This requirement holds true for effective team involvement and decision making when team members are from the same or like-minded

organizations. The situation is different in multiple stakeholder environments assigned with planning and management tasks. Although mental models' approaches may not get conflicted groups to work together, they may identify where differences and similarities in their conceptualizations lie and then these can be used to bring better collaboration and enhance collective decision making (Du Toit et al., 2011).

Collins and Gentner (1987) suggest that individuals tend to make use of their mental models to borrow information from a familiar domain to explain an unfamiliar one (e.g., use the water flow mental model to explain the electrical current). Phenomena which cannot be directly perceived is normally explained using this trick based on analogies (Rickheit & Sichelschmidt 1999). Analogical thinking allows people to "create new mental models that they can then run to generate predictions about what should happen in different situations in the real world" (Collins & Gentner 1987:243), corroborating with the conclusion from Gentner and Gentner (1983) that people use analogies in their cognitive processes.

Although incomplete and inconsistent representations of reality, as any other model (Lynam & Brown, 2012), the literature has an overall agreement that mental models are "working models" (Craik, 1943; Johnson-Laird, 1983) and are, therefore, dynamic in three ways: Reasoning (explore and test different possibilities mentally before acting); Causal dynamics (represent perceived cause-and-effect dynamics of a phenomenon); and Learning (the capacity to change over time through experience and learning, based on information feedback loops) (Jones et al., 2011). According to Lynam and Brown (2012), mental models change over time, can adapt to changing circumstances, and may evolve through learning.

Lynam et al. (2012) argue that the concept of mental models has quite different meanings across a diverse spectrum of academic disciplines because mental models are unobservable. In other words, it is very difficult to form a representation of them. Nevertheless, Lynam et al. (2012) identified three shared or core dimensions of the mental model's concept: long-term and stable knowledge structures; the situation in which the individual or group finds itself; and the attributes of the individual.

Mental model studies have been conducted across many fields and are used across a diverse spectrum of academic disciplines (Lynam et al., 2012). The theory is recognized as a process of "elaboration, communication and dissemination" (Wagner & Hayes, 2005:322). According to Lynam et al. (2012), the concept of mental model provides a sense-making device useful to understand how people think and communicate in human-environment interactions.

In the field of project management, some studies already explored this theory to understand stakeholders' construction of how the system functions and what values might be

brought to bear on actual practices. Daniel and Daniel (2018) suggest that a more appropriate contingent and comprehensive management approach can be selected by project managers based on a better understanding of the complexity and uncertainty involved in the projects and their management.

3. Research method

An empirical investigation was carried out through a survey to achieve the objectives of this research and answer the proposed research question. An Analysis of Variance (ANOVA) was adopted to test differences of perception of three different stakeholders' groups, concerning the value realized by the projects. Complementary *post-hoc* tests were employed to establish multiple comparisons between the groups.

3.1. Anova

ANOVA consists of a technique to amplify the student t-test to three or more groups, even though it can be used for two groups (Hair Jr., William, Babin & Anderson, 2019). A Student t-test is performed to observe whether two means from different groups, regarding a given variable, differ in statistical terms, otherwise, if their difference is statistically significant. However, a t-test can be used only for two groups. If their means on a specific variable is different, and this difference has a p-value less than or equal two 5%, we can assume that they are statistically different, and the greater mean of one group is different from the other one. A p-value is the probability of the result of the null hypotheses, given our data. In the t-test, the null hypothesis (H₀) states that the difference between the two means does not exist. If the probability of H₀ is equal to, or less than 5%, we assume that the alternative hypothesis is the correct, and then the difference is statistically significant.

An Anova is the same test but considering the difference between more groups. However, the Anova does tell where the difference is, and a *post-hoc* (a posteriori) test must be made to observe multiple comparisons between the groups, to observe the difference between the means, two by two. There are multiple types of *post-hoc* tests, and they vary according to the characteristics of the data, and the objective of the study. The most used tests are the Scheffé (the more conservative test), Tukey's HSD, Tukey's LSD (Fisher), the Newman-Keuls and the Duncan. In this study, due to the objective of observing confidence intervals, and controlling the least difference, Tukey's HSD *post-hoc* tests was performed (Hair et al., 2019).

A minimum of 30 valid answers from each group was adopted as necessary to have a significant statistical result, extrapolating Hair's (2009) recommendation of having a minimum

of 20 valid responses for each group considered in the analysis. As a maximum of five dependent variables was tested, the recommendation of Hair et al. (2009) of having groups samples bigger than the quantity of dependent variables was also satisfied.

4. Data analysis

4.1. Variables declaration

The perception of value has no consensual measure in the existing literature. Thus, this study sought approaches of value measurement in projects that could reconcile the same object of observation for different stakeholders and allow the comparison of perceptions. However, no specific scale of value measurement in the project field was identified in the literature. Considering that “value” is created through benefits realization from the output and outcome of the projects, the scale of project success of Shenhar and Dvir (2007) was adopted in this survey as a proxy to assess the perceptions of value realized.

Each of the five dimensions of the scale proposed by Shenhar and Dvir (2007) is assessed in a different time frame when the stakeholders are, theoretically, able to have a better perception of the benefits generated by the project’s output. Thus, a list of 23 single variables, as presented on table 4, was created anchored on questionnaire of Shenhar et al. (2001) applied to measure project success. Each of these single variables were transformed in a statement, which was presented to respondents to rate the extent of his/her agreement based on a 5-point Likert scale of 1 (Strongly agree) to 5 (Strongly disagree).

Table 1 - Single dependent variables

Variable name	Description	Success dimension	Time frame
PE1	Schedule	Project efficiency	Very Short term
PE2	Budget	Project efficiency	Very Short term
IC1	Scope	Impact on customer	Short term
IC2	Customer satisfaction	Impact on customer	Short term
IC3	Cost x benefit	Impact on customer	Short term
IC4	Partnership with customer	Impact on customer	Short term
IT1	Development team needs	Impact on team	Short term
IT2	Development team new knowledge	Impact on team	Short term
IT3	Satisfaction	Impact on team	Short term
BS1	Performance improvement	Business and Direct Success	Long term
BS2	Share value increase	Business and Direct Success	Long term
BS3	Comercial result	Business and Direct Success	Long term
BS4	Market share	Business and Direct Success	Long term
BS5	Revenue/profit for long time	Business and Direct Success	Long term
BS6	Operation and maintenance costs reduction	Business and Direct Success	Long term
BS7	Benefit	Business and Direct Success	Long term
BS8	Profit to owner	Business and Direct Success	Long term
BS9	Profit to contractor	Business and Direct Success	Long term
PF1	New market creation	Prepare the Future	Very Long Term
PF2	New product	Prepare the Future	Very Long Term
PF3	New technology	Prepare the Future	Very Long Term
PF4	Organization capacity enhancement	Prepare the Future	Very Long Term
PF5	Motivation for future projects	Prepare the Future	Very Long Term

Source: Author

These positions were coded on a discrete and continuous scale from 1 to 5 for the calculations of the study. The survey instrument also includes demographic and characterization measures of the sample, such as age, gender, education, length of professional experience and in projects, role in the projects, as well as the type of project of involvement of the respondent, and sector of activity. To avoid desirability issues on the answers, related to project success, and to induce people to think about value realization and project success, respondents were asked to provide data for a previous project in the section two of the questionnaire, before evaluating the asserts about value realized by projects.

The survey was distributed in social networks and professional groups of project management field. It was also directly sent to the research's professional network and to the group of *stricto sensu* students at the university as well. A total of 183 valid completed questionnaires were collected and analyzed, as presented in the following sections.

4.2. RESPONDENTS' BACKGROUND AND PROJECTS' CHARACTERISTICS

The demographic details of the professionals who answered the survey are presented in tables 5 and 6, while the characterization of the projects considered in the survey are presented in tables 7 and 8. The respondents are between 22 and 72 years old, as showed in figure 6. Overall, the respondents can be considered mature, as the average age is 46 years old and 24,6% are between 50 and 58 years old. Most of them are male (75%) and have extensive experience with project management and as project manager specifically. As presented in table 5, 60,6% of them have more than 10 years of experience in project management (12,7 years in average) and 29% have actuated as project manager for more than 10 years (5,9 years in overall average). The educational level can be considered high as well, since 68,4% of the respondents have a post-graduation level (*lato* or *stricto sensu*), as shown in table 6.

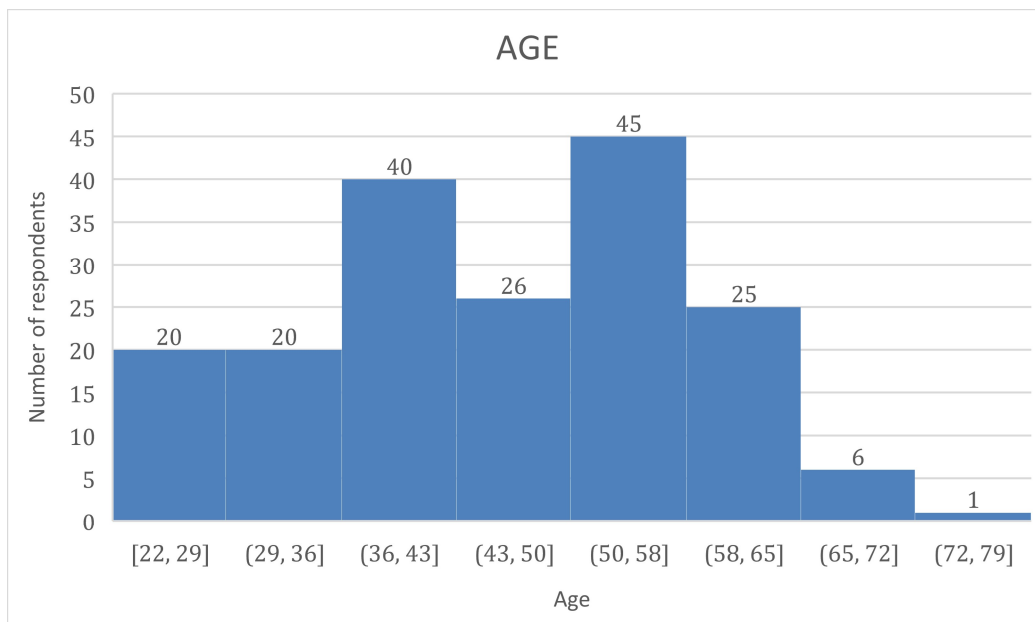


Figure 6 - Age of the respondents

Source: Author

Table 2 - Experience of the respondents

Range	Experience			
	In project management		As project manager	
	Qty (n)	%	Qty (n)	%
0 years	19	10,4%	69	37,7%
1-4 years	27	14,8%	33	18,0%
5-9 years	26	14,2%	28	15,3%
10-14 years	35	19,1%	21	11,5%
15-19 years	26	14,2%	15	8,2%
20-24 years	26	14,2%	12	6,6%
25-29 years	8	4,4%	5	2,7%
> 30 years	16	8,7%		0,0%
Total	183		183	

Source: Author

Table 3 - Educational level

Level	Qty (n)	%
High school	58	31,7%
Specialization (lato sensu)	98	53,6%
Master degree	19	10,4%
Doctorate degree (Phd)	8	4,4%

Source: Author

Concerning the characterization of the projects mentioned by the respondents, almost half of them (48,1%) were developed in industry economic sector, as presented in table 7, while the fixed price was the contract type most adopted (60,5%), as presented in table 8.

Table 4 - Economic sector

Economic sector	Qty (n)	%
Industry	88	48,1%
Information Technology	43	23,5%
Service	30	16,4%
Others	10	5,5%
Infrastrucutre	6	3,3%
Education	6	3,3%

Source: Author

Table 5 - Contract type

Contract Type	Qty (n)	%
Fixed price	49	60,5%
Time & Material (T&M)	11	13,6%
Cost reimbursable	9	11,1%
No contract (internal project)	5	6,2%
Others	7	8,6%

Source: Author

The respondents were asked to indicate which aspects they considered important to the result of the projects they adopted to answer the survey. As presented in the table 9, scope/quality was mentioned in more than 70% of the projects, while schedule and cost were mentioned in more than 60% of the projects. The customer relationship was indicated as an important aspect of project success by less than half of the respondents (44,8%). Aspects as revenue, market position of the company, and end user satisfaction were indicated by few respondents.

Table 6 - Relevance to the result of the project

Item	Qty (n)	%
Scope/quality	142	77,6%
Schedule	116	63,4%
Cost	113	61,7%
Customer relationship	82	44,8%
Other	5	2,7%

Source: Author

As presented in tables 10 and 11, both scope and the schedule were not totally defined in the beginning of the projects. In both cases, more than half (59% concerning scope, and 62,8% concerning schedule) were pre-defined (previous version) and were reviewed after the requirements gathering step.

Table 7 - Readiness of the scope in the project start

Scope status (project starting)	Qty (n)	%
Previous version prior to requirements gathering	108	59,0%
Scope not defined	43	23,5%
Scope frozen	26	14,2%
Not known	6	3,3%

Source: Author

Table 8 - Readiness of the schedule in the project start

Schedule status (project starting)	Qty (n)	%
Previous version prior to requirements gathering	115	62,8%
Schedule frozen	41	22,4%
Schedule not defined	21	11,5%
Not known	6	3,3%

Source: Author

More than half of the projects (56%) were considered internal (when the customer is another department inside the parent organization). Almost all of them (91,3%) were developed to a customer located in Brazil. The team was distributed (multi-site or multi-located team) in 65,8% of the projects. The projects were considered strategic in 73,8% of the responses, while 97,8% of them were assessed as of medium or high complexity. Private sector was the majority as well (87,4% of the projects).

The respondents were also asked to intuitively classify “how hybrid” was the methodology adopted to manage the projects. As indicated in figure 7, most of them were classified as “around 50% hybrid” (47,6% in average; 29,3% Standard Deviation). A total of 19 projects were classified as “full traditional” and only 9 projects were classified as “full agile”.

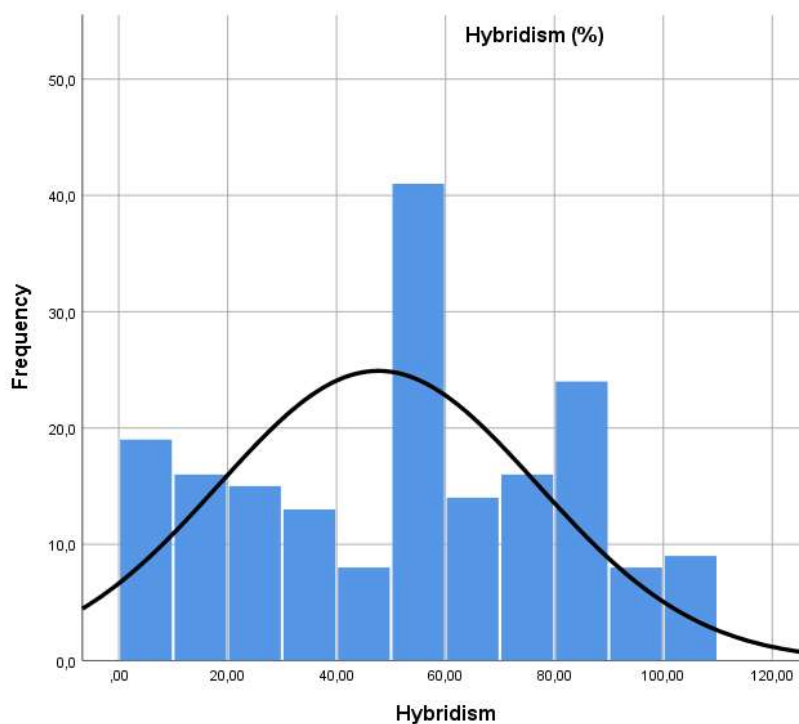


Figure 7 - Level of hybridism

Source: Author

Finally, the time after project closure was also asked to the respondents. The result is presented in table 12, with a prevalence to projects terminated before 12 months (Short time frame, as defined by Shenhar et al., 2001) and after 24 months (Very long-time frame, as defined by Shenhar et al., 2001).

Table 9 - Time after project closure

Time after project closure	Qty (n)	%
< 2 months	31	16,9%
2-12 months	61	33,3%
13-24 months	21	11,5%
> 24 months	61	33,3%
Not informed	9	4,9%

Source: Author

5. Results

Prior to perform the variance analysis, the different stakeholders were grouped following stakeholders' classification proposed by Davis (2014). Thus, three groups were created, as presented in Figure 8. The respondents which self-declared "others" were reclassified into one of the three groups according to their own description of their roles in the project.

Role in the project			Classification as proposed by Davis (2014)		
	Qty (n)	(%)	Stakeholder group	Qty (n)	(%)
Executive of the project's owner	8	4%	Senior management	54	30%
Executive of the contractor	25	14%			
Programmm of portfolio manager	19	10%			
Shaholder	0	0%			
Sponsor	2	1%			
Development team member	47	26%	Project core team	94	51%
Project manager / Scrum Master / Product Owner	46	25%			
Customer	18	10%	Project recipient	35	19%
Final user of the project asset	13	7%			
Other	5	3%			
Total	183	100%		183	100%

Figure 8 - Classification of the stakeholders' groups according to Davis (2014)

Source: Author

However, the group "Project core team" (n=94) became much bigger than the others, resulting in a rate of 2,7 when compared with the smallest group ("Project recipient"; n=35). Hair et al. (2009) recommends performing multivariate analysis with groups of similar size. According to the author, the biggest group should be less than 1,5 times the smallest group.

Thus, the group “Project core team” was split in two groups, (“Project manager” and “Development team”), as shown in figure 9. This way, the rate between the biggest and the smallest groups became in accordance with Hair’s recommendation (1,54) and allow a more detailed analysis. Additionally, this modification enables to compare project manager with the other groups of stakeholders, which seems important for research, despite being different from what Davis (2014) adopted in his theoretical study.

			Classification acc. Stakeholder profile		
Role in the project	Qty (n)	(%)	Stakeholder group	Qty (n)	(%)
Executive of the project's owner	8	4%	Senior management	54	30%
Executive of the contractor	25	14%			
Programmm of portfolio manager	19	10%			
Shaholder	0	0%			
Sponsor	2	1%			
Development team member	47	26%	Development team	48	26%
Project manager / Scrum Master / Product Owner	46	25%	Project manager	46	25%
Customer	18	10%	Project recipient	35	19%
Final user of the project asset	13	7%			
Other	5	3%			
Total	183	100%		183	100%

Figure 9 - Classification of the stakeholders' groups according to stakeholder profile
Source: Author

5.1. Perception of general value realized

The variable “Value” was calculated as an average of the 23 single variables presented in table 4. “Value” was used to calculate the perception of each stakeholder group concerning the value realized by the projects. As presented in table 13, customer and end users (“Project recipient”) have the perception that projects realize “less value” when comparing with the other three groups (mean = 2,0335). However, the variance of the group is the biggest (SD = 0,62715), indicating a greater discordance inside the group when compared to the others.

Table 10 - Sample descriptive statistic

Stakeholders' groups	n	Mean	SD	Std Error	95% confidence interval for mean		Minimum	Maximum
					Lower bound	Upper bound		
Senior management	54	1,5362	0,42683	0,05808	1,4197	1,6527	1,00	2,65
Project recipient	35	2,0335	0,62715	0,10601	1,8181	2,2490	1,00	3,04
Project manager	46	1,6323	0,37956	0,05596	1,5196	1,7450	1,00	2,65
Development team	48	1,6449	0,43491	0,06277	1,5186	1,7712	1,00	2,48
Total	183	1,6840	0,49198	0,03637	1,6123	1,7558	1,00	3,04

Source: Author

ANOVA confirmed a significant difference among the groups: $F(3; 91,592) = 5,582$, $p < 0,01$. The possibility of this result is due to a casualty is smaller than 0,5% ($p < 0,05$), and *post-Hoc* tests (table 14) confirmed that “Project recipients” have a significant different perception of value realized by the projects, when compared to the other groups. Welch’s statistic was adopted, instead of F, following Field’s recommendation (Field, 2009) when there is significant difference among groups (Levene’s test resulted not significant: $p < 0,05$).

Table 11 - Perception of general value realized - *post-Hoc* tests

Stakeholders' groups		Mean difference (I-J)	Std Error	Sign.	95% confidence interval for mean	
					Lower bound	Upper bound
Senior management	Project recipient	-0,497	0,101	0,000 (*)	-0,758	-0,237
	Project manager	-0,096	0,093	0,730	-0,337	0,145
	Development team	-0,109	0,092	0,638	-0,347	0,130
Project recipient	Project manager	0,401	0,104	0,001 (*)	0,132	0,671
	Development team	0,389	0,103	0,001 (*)	0,122	0,656
Project manager	Development team	-0,013	0,096	0,999	-0,260	0,235

(*) $p < 0,05$

Source: Author

5.2. Perception of value realization in each dimension of project success

The five dimensions of the project success scale from Shenhar and Dvir (2007) were adopted to perform ANOVA analysis aiming a more detailed comprehension concerning the gaps in the stakeholder’s perceptions of the value realized by the projects. This way, it was possible to assess how the stakeholders perceive the value realized in different time frames after the project is completed. New variables were created corresponding to each of the success

dimensions of the project success scale. The new variables were calculated as the average of its set of single variables, as presented in table 4. These new variables are presented table 15.

Table 12 - Dependent variables based on project success scale

Variable name	Success dimension (Shenhar & Dvir, 2007)	Time frame	Time after project closure (Shenhar et al., 2001)
SP_PE	Project efficiency	Very Short	Less than 2 months
SP_IC	Impact on customer	Short	Between 2 and 12 months
SP_IT	Impact on team	Short	Between 2 and 12 months
SP_BS	Business and direct success	Long	Between 13 and 24 months
SP_PF	Preparation for the future	Very Long	More than 24 months

Source: Author

The descriptive statistics of the groups, presented in table 16, show that “Project recipient” group have bigger means, when compared to the other groups, concerning variables SP_IT, SP_BS, and SP_PF. This partial result confirms that customers and end-users do not feel much value in terms of impacts on benefits generated to the development team, effects on the business and contributions concerning a preparation for future projects. However, the variances are also bigger in these variables, confirming that this perception is not uniform inside the group.

On the other hand, the project efficiency is not so “valuable” to the development team as it is to the other stakeholders’ groups. This is explained by the bigger mean of this group on dependent variable SP_PE. Like the results found with “Customer recipient” group on other variables, the bigger variance of the project efficiency value to the development team indicates a lack of uniformity inside the group.

Overall, these results confirm that the perception of value realized by the projects differs among the stakeholders’ groups and over the time. The project efficiency seems to be not so valuable to the development team, while the customers and end-users do not perceive much value on medium- and long-term, considering the project closure milestone.

Table 13 - Descriptive statistics of the groups

Stakeholder group	n	Project efficiency		Impact on customer		Impact on team		Business and direct success		Preparation for the future	
		SP_PE	SD	SP_IC	SD	SP_IT	SD	SP_BS	SD	SP_PF	SD
Senior management	54	1,7500	0,87281	1,2731	0,30043	1,9383	0,84940	1,4918	0,47661	1,5000	0,48951
Project recipient	35	1,6000	0,72558	1,4000	0,40765	2,7619	1,29244	1,9460	0,61651	2,4343	1,07647
Project manager	46	1,8043	0,69505	1,2772	0,29453	2,0870	0,78704	1,4976	0,38471	1,8174	0,54947
Development team	48	2,0104	1,00260	1,4167	0,45644	1,9236	0,76951	1,5880	0,48889	1,6167	0,54239
Total	183	1,8033	0,84813	1,3361	0,37031	2,1293	0,96313	1,6053	0,51443	1,7891	0,74146

Source: Author

Levene's tests confirmed that the variances of the groups are not significantly equivalent in general, except for "Project efficiency" variable. Notwithstanding, the statistic result from Anova demonstrated that the groups have significantly different perceptions of the value realized by projects in a significant level of less than 0,1% in three dependent variables, partially confirming the initial hypothesis. The variable "Project efficiency" was rejected. The "Impact on customer" was also rejected, but the significant level was slightly above 10%. Thus, it is possible to affirm that the hypothesis is confirmed concerning medium- and long-term but rejected when the assessment is focused on the short-term, considering the project closure milestone. The results are presented in table 17.

Table 14 - ANOVA results

Variable	Levene	sign	Variable	F	sign
SP_PE	0,866	0,460	SP_PE	1,716	0,165
SP_IC	3,724	0,012	SP_IC	2,048	0,109
SP_IT	8,162	0,000	SP_IT	7,161	0,000 (*)
SP_BS	4,490	0,005	SP_BS	7,390	0,000 (*)
SP_PF	24,536	0,000	SP_PF	15,418	0,000 (*)

(*) $p < 0,001$

Source: Author

Post-Hoc tests of multiple comparisons among the groups confirmed that the project recipients (customers and end users) change their perceptions of value realized by the projects as time goes by, as presented on table 18. This result corroborates with Shenhar and Dvir (2007) recommendation of starting to measure the benefits generated by the projects some months after the project is closed. There is also an indicative that project manager and senior management have different perceptions concerning the contribution of a project to the preparation for the future projects, as the *post-hoc* tests showed with a significant level of less than 10%.

Table 15 - Perception of general value realized - *post-Hoc* tests

Project success dimension		SP_PE	SP_IC	SP_IT	SP_BS	SP_PF
Time frame		Very short	Short	Short	Long	Very long
Stakeholder groups		Sign.	Sign.	Sign.	Sign.	Sign.
Senior management	Project recipient	0,845	0,386	0,000 (*)	0,000 (*)	0,000 (*)
	Project manager	0,989	1,000	0,851	1,000	0,085 (***)
	Development team	0,406	0,203	1,000	0,755	0,814
Project recipient	Project manager	0,702	0,445	0,007 (**)	0,000 (*)	0,000 (*)
	Development team	0,130	0,997	0,000 (*)	0,007 (**)	0,000 (*)
Project manager	Development team	0,637	0,257	0,824	0,807	0,464

(*) $p < 0,001$

(**) $p < 0,05$

(***) $p < 0,10$

Source: Author

6. Discussion

Unless it is known that all stakeholders focus on iron triangle as the main output of a project, Davis (2014) argues that there is a lack of agreement in perceptions of project success factors among stakeholders. Davis (2016) identified that client, customer and end-users agree concerning the value perceived, but other stakeholders, like the sponsor and the project owner, could not agree, thus they should be also consulted.

This survey used the construct of project success as a proxy to investigate how multiple stakeholders perceive the value realized by the projects, adopting the project success scale proposed by Shenhar and Dvir (2007) as a proxy. Points of agreement and points of disagreement appeared in the results, when compared with the literature.

Results confirmed an agreement among the stakeholders around the iron triangle, as no significant difference was achieved in the variable “Project Efficiency” (SP_PE). Thus, the four groups analyzed in this paper agree that closing the project within the budget and in accordance with the schedule previously defined realize value. This corresponds to the dimension of project efficiency, measured in a very short time frame, or a short-term result, proposed by Shenhar et al. (1997).

Impact of project’s outcome on the customer seems to be a consensus between different stakeholders as well, as the variable “Impact on customer” (SP_IC) resulted non-significant. The overall average of this variable is the lowest among all (1,3361), which means that the impact of the project on the customer is important to all stakeholders, similarly as project efficiency. As scope is one of the single variables of SP_IC, this result confirms the relevance of the scope, likewise schedule and cost. This result is closed to what the literature has already reported about the relevance of the iron triangle, but didn’t confirm that scope is more important than cost and schedule, as stated by Shenhar et al. (1997) and Serrador and Pinto (2015).

Moreover, there is an indicative that the customer-centric paradigm (Winter & Szczepanek, 2008) is not yet totally adopted by the projects. Less than half (44,8%) of the respondents consider customer satisfaction and customer relationship relevant to the project result. This outcome lights up an alert, as indicates that the customer is probably not participating in the project execution as a co-creator of the value construction. This lack of alignment with the Service Dominant Logic (SD-L), proposed by Vargo and Lusch (2004), and servitization movement (Vandermerwe & Rada, 1988) means that a long-term partnership is not yet the priority of the projects, replacing the concept of a unique transactional relationship between contractor and customer.

A significant difference of stakeholder's perceptions was confirmed in the dependent variables "Impact on team" (SP_IT), "Business success" (SP_BS) and "Preparation for the future" (SP_PF). The "project recipient" group (customer and end-users) has a significant different perception of the medium- and long-term benefits, when compared to other groups. As these variables are concerned with improvement of the development team (SP_IT), and strategic benefits (SP_BS and SP_PF), it is understandable that they represent more value to executives, project manager, and development team than to customers and end-users.

It is largely discussed and accepted by the literature that distinct stakeholders have their own objectives with the project, and these objectives are not necessarily congruent (Shenhar et al., 2002; Freeman & Beale, 1992; Pinto & Mantel, 1990; Davis, 2016; Turner & Zolin, 2012; Turner, 2015). Different causes to this behavior are presented by the literature as well.

Jiang et al. (2009) argues that the perception gap between development team and end users starts in the requirements gathering and normally become a risk to the project success. Approximately 60% of the respondents of this survey answered that both scope and schedule were reviewed after requirements gathering. If scope and schedule are reviewed during the project execution, after the requirements are clearer, gaps between development team and customer recipients should be reduced. Thus, this hypothesis seems not applicable in this situation.

Cox et al. (2003) argues that perceptions can differ among professionals based upon their number of years of experience. But this statement is contested by Toor and Ogunlana (2010), as they didn't find evidence of a possible influence of years of experience in project management or as project manager. Thus, the influence of the experience seems controversial. The results here obtained confirm this ambiguity. Although there are significant differences between groups in most of the pairwise analysis in terms of experience in project management (table 19) and as project manager (table 20), the differences of value perception do not confirm any influence of the previous experience in the perceptions of value realization. Thus, the results seem closer to what Toor and Ogunlana (2010) found. In other words, besides a significant difference of experience in project management and in the role of project manager, the perceptions' gaps are smaller than expected by Cox et al. (2003).

Table 16 - ANOVA - Experience in project management

Stakeholder groups		Mean difference (I-J)	Std Error	Sign.	95% confidence interval for mean	
					Lower bound	Upper bound
Senior management	Project recipient	12,156	1,8359	0,000 (*)	7,395	16,917
	Project manager	5,436	1,6975	0,009 (**)	1,033	9,838
	Development team	9,579	1,6783	0,000 (*)	5,226	13,931
Project recipient	Project manager	-6,72	1,8977	0,003 (**)	-11,642	-1,799
	Development team	-2,5774	1,8805	0,519	-7,454	2,299
Project manager	Development team	4,1431	1,7456	0,086 (***)	-0,384	8,670

(*) p < 0,001

(**) p < 0,05

(***) p < 0,10

Source: Author

Table 17 - ANOVA - Experience as project manager

Stakeholder groups		Mean difference (I-J)	Std Error	Sign.	95% confidence interval for mean	
					Lower bound	Upper bound
Senior management	Project recipient	6,948	1,422	0,000 (*)	3,261	10,634
	Project manager	2,507	1,314	0,229	-0,901	5,916
	Development team	7,354	1,299	0,000 (*)	3,984	10,724
Project recipient	Project manager	-4,440	1,469	0,015 (**)	-8,251	-0,630
	Development team	0,407	1,456	0,992	-3,369	4,183
Project manager	Development team	4,847	1,352	0,002 (**)	1,342	8,352

(*) p < 0,001

(**) p < 0,05

Source: Author

Therefore, it seems that the causes of the differences in the perception of value realized by projects are not yet well explained by the literature, and some other cause must be proposed. This paper proposes to fill in this gap adopting mental models as a theoretical lens. According to Lynam et al. (2012), the concept of mental models provides a sense-making device useful to understand how people think and communicate in human-environment interactions. Some studies have already explored this theory in the context of project management to understand stakeholders' construction of how the system functions and what values might be brought to bear on real practices.

Mental models construct provides a mechanism that may enhance the ability to understand the motivations for human behavior where other social science constructs, such as attitudes, values, and beliefs, have proved limited (Jones et al., 2011). A mental model approach to cognition goes beyond stakeholders' preferences, goals, and values associated with a given

situation and can provide a rich picture of how stakeholders understand and assess the value realized by the projects.

Despite the gaps can be explicated by mental models' theory, the similarities among executives, project manager and development team are still lacking understanding and causing some inquietude. Each stakeholder is accustomed to perceiving projects from its own experience and individual interests, without fully considering the project situation and concerns of other stakeholders. However, consensus can be achieved through a mutual dialog among diversified stakeholder groups (Yuan, 2017). Yu and Petter (2014) defend that high levels of interaction and collaboration inside a team can be achieved through the adoption of and agile practices, fostering an easier adaptation to customer's changing requirements and leading to better project outcomes.

According to Yu and Petter (2014), the employment of agile practices can foster a mutual understanding of value realized, increasing the team shared mental model, through a higher level of transparency and integration among the team. We broaden this understanding considering that the senior executive level, the project manager, and the development team are inside the same team. Consequently, agile practices tend to increase the team shared mental models, reducing gaps in the way the different stakeholders see the value realized by the project through benefits realization by the outcome.

Differently from agile practices which are proposed by practitioners based on work experience, shared mental models' practices are developed based on team cognition and organizational behavior theory as well as empirical evidence (Yu & Petter, 2014). According to the authors, shared mental models' practices help to understand the value of agile practices to improve collaboration and reduce misunderstanding, helping the team to react properly to new events and requirements changing (Mohammed et al., 2010).

Approximately 90% of the projects here analyzed apply agile practices in different degrees. Considering the concepts here presented, and brought from the literature, it is possible to suppose that a shared thought and understanding was developed in the projects here analyzed through the agile practices approach. This unification of individual mental models fostered a shared mental model inside the groups of stakeholders, minimizing the perception gaps concerning the value realized by the projects. According to Yu and Peter (2014), due to the diversity of available agile practices, it is common for organizations to adapt a few agile practices rather than implement a full agile methodology. The value of agile practices over traditional methods is a greater integration inside the team and with the customers, allowing

easier adaptation to requirements changing and leads to better project outcomes (Yu & Peter, 2014).

Therefore, according to the literature, senior executives, project managers and development team should have different perceptions of value realized by the projects in a significant level, but these differences were not achieved by this survey. On the other hand, the project receivers (customer and end-users) tend to perceive the value realized only in a short-term. The value is partially perceived in the medium-term, only in benefits directly related to project receivers. The remaining benefits realized by the projects are perceived only by high executive level, project manager and development team. The proposal is to anchor the understanding of these similarities and differences of perceptions on mental models and shared mental model's theories.

7. Conclusion

The main objective of a project is to create value to all stakeholders through the benefits generated by its outcomes. Value can assume tangible or intangible forms, so it cannot be totally measured objectively. However, multiple stakeholders perceive differently the value realized by the projects' outcome. This paper confirmed this through a survey realized in four groups of stakeholders: senior executives, project managers, development team, and project recipients. As no specific scale to measure value realization was localized in the literature, the project success scale proposed by Shenhar and Dvir (2007) was adopted as a proxy to create the questionnaire. A survey was carried out with 183 respondents from different projects.

The result showed that, generally, project recipients, formed by customers and end-users, have a different perception of the value offered and realized by the projects, compared with the other three groups of stakeholders. The difference is stronger in medium- and long-term aspects, or some months after the project is declared concluded. On the other side, the four groups of stakeholders have similar perception of value realization in the short-term. This finding is important because projects are executed to promote changes and benefits to customers and end-users at a first level, but multiple stakeholders are covered by the benefits generated through the project outcome. Thus, all stakeholders aim to obtain some value from the execution of projects.

However, each stakeholder perceives the value realized differently, according to his/her own experience, background, and individual interests, without considering the other stakeholders. Consequently, it is quite impossible to achieve a consensus among multiple

stakeholders concerning the value realized. Based on this premise, it seems essential to understand how this mechanism of human perception works in order to make proper decisions, during project execution, in order to prioritize the benefits generated by the outcomes, according to the main stakeholders.

Mental models and shared mental models' theories are proposed by this paper to ground this understanding of how humans' cognition process works and evolve over time, according to environment situations, individual experiences, and knowledge. It is important to provide a baseline to project managers to make best decisions during project execution, prioritizing the outcomes and, consequently, the benefits to the stakeholders. According to the results here presented, it is better not to expect a consensus concerning the value offered and realized, because it seems to be an impossible result.

8. Limitations, contributions, and further studies

This paper contributes to practitioners giving a broader view of how different stakeholders perceive the project's outputs and outcomes. It was also possible to realize that the customer seems not to be yet at the center of the projects, which lights up a warning light. The discussion about human cognition process is also relevant to practitioners, as the projects are made by humans and their assets are used by humans as well.

The academic contributions include a progress of the proposal from Davis (2014) to join the stakeholders in groups and assess their perceptions. In this paper, instead of comparing the stakeholders' perception of project success, it was assessed their perceptions of value realized by the projects. The discussion about the differences of perceptions of multiple stakeholders based on real data collected from practitioners represents another contribution to literature. Finally, the proposal of using mental models to understand why stakeholders have different perceptions of value realized by the project's outcome represents a contribution and opens an avenue to further investigations.

As the data collected by the survey is restricted to projects developed in Brazil with Brazilian practitioners, it is included in the limitations of this paper. A more comprehensive sampling could provide deeper analysis and broader results.

Further studies can deepen the analyses and confirm some assumptions made here. Case studies can be made to investigate specific points discussed here. Further studies approaching agile practices can contribute with shared mental models as agile methodologies tend to reduce the gaps between stakeholders.

References

- Bryde, D.J., Brown, D., (2005). The influence of a project performance measurement system on the success of a contract for maintaining motorways and trunk roads. *Project Management Journal* 35 (4), 57–65.
- Cannon-Bowers, J. A., Salas, E., & Converse, S. A. (1993). Shared mental models in expert team decision making. In N. J. Castellan, Jr. (Ed.), *Current issues in individual and group decision making* (pp. 221-246). Hillsdale, NJ: Erlbaum.
- Cleland, D.I., Ireland, L.R., (2006). *Project Management Strategic Design and Implementation*, fifth ed. McGraw Hill, New York, NY.
- Collins, A., and D. Gentner. (1987). How people construct mental models. Pages 243-268 in D. Holland and N. Quinn, editors. *Cultural models in language and thought*. Cambridge University Press, Cambridge, UK.
- Cox, R.F., Issa, R.R.A., Aherns, D., (2003). Management's perception of key performance indicators for construction. *Journal of Construction Engineering and Management* 129 (2), 142–151.
- Craik, K. (1943) *The Nature of Explanation*, Cambridge University Press
- Curtis, B., Krasner, H., Iscoe, N., (1988). A field study of the software design processes for large systems. *Communications of the ACM* 31 (11), 1268–1287.
- Daft, R.L., Lengel, R.H., (1986). Organizational information requirements, media richness and structural design. *Management Science* 32 (5), 554–571
- Daniel, P. A., & Daniel, C. (2018). Complexity, uncertainty and mental models: From a paradigm of regulation to a paradigm of emergence in project management. *International journal of project management*, 36(1), 184-197.
- Davidson, E.J. (2002). Technology frames and framing: a socio-cognitive investigation of requirements determination. *MIS Quarterly* 26 (4), 329–358.
- Davis, K. (2014). Different stakeholder groups and their perceptions of project success. *International Journal of Project Management* 32 () 189–201.

- Davis, K. (2016). A method to measure success dimensions relating to individual stakeholder groups, *International Journal of Project Management*, 34(3), 480-493, <https://doi.org/10.1016/j.ijproman.2015.12.009>.
- Du Toit, D. R.; Biggs, H.; Pollard., S. (2011). The potential role of mental model methodologies in multistakeholder negotiations: integrated water resources management in South Africa. *Ecology and Society* 16(3): 21. <http://dx.doi.org/10.5751/ES-04237-160321>
- Freeman, M., Beale, P. (1992). Measuring project success. *Proj. Manag. J.* 23 (1), 8–18.
- Forrester, J., (1961). *Industrial Dynamics*. MIT Press.
- Galbraith, J.R., (1973). *Designing Complex Organizations*. Addison-Wesley, Reading, MA
- Gentner, D., Gentner, D.R. (1983). Flowing waters or teeming crowds: mental models of electricity. Pages 99-130 in D. Gentner and A. Stevens, editors. *Mental models*. Lawrence Erlbaum, Hillsdale, New Jersey, USA.
- Gray, S. R. J., Gagnon, A. S., Gray, S. A., O'Dwyer, B., O'Mahony, C., Muir, D., ... & Gault, J. (2014). Are coastal managers detecting the problem? Assessing stakeholder perception of climate vulnerability using Fuzzy Cognitive Mapping. *Ocean & Coastal Management*, 94, 74-89.
- Hair Jr., J.F.; William, B.; Babin, B.; Anderson, R.E (2019). *Multivariate data analysis*. 8th.ed. Hampshire: Cengage Learning EMEA
- Jiang, J.J., Klein, G., Discenza, R., (2002). Perception differences of software success: provider and user views of system metrics. *Journal of Systems and Software* 63 (1), 17–27.
- Jiang, J.J.; Klein, G.; Wu, S.P.J.; Liang T.P. (2009) The relation of requirements uncertainty and stakeholder perception gaps to project management performance. *The Journal of Systems and Software* 82 (2009) 801–808.
- Johnson-Laird, P. N. (1980). Mental models in cognitive science. *Cognitive science*, 4(1), 71-115.

- Johnson-Laird, P.N. (1983). *Mental models: Towards a cognitive science of language, inference, and consciousness* (No. 6). Harvard University Press.
- Johnson-Laird, P.N. (1986). *Mental models: towards a cognitive science of language, inference and consciousness*.
- Jones, N. A., H. Ross, T. Lynam, P. Perez, and A. Leitch. (2011). Mental models: an interdisciplinary synthesis of theory and methods. *Ecology and Society* 16(1): 46. [online] URL: <http://www.ecologyandsociety.org/vol16/iss1/art46/>
- Jugdev, K., Müller, R., (2005). A retrospective look at our evolving understanding of project success. *Project Management Journal* 36 (4), 19–31.
- Klein, G., & Jiang, J. J. (2001). Seeking consonance in information systems. *Journal of Systems and Software*, 56(2), 195-202.
- Klein, G., Jiang, J. J., & Sobol, M. G. (2001). Consonance in information systems. In *Strategies and organizations in transition*. Emerald Group Publishing Limited.
- Langan-Fox, J.; Code, S.; Langfield-Smith, K. (2000). Team mental models: techniques, methods and analytic approaches. *Human Factors* 42:242-271.
- Langan-Fox, J., Wirth, A.; Code, S.; Langfield-Smith, K.; Wirth, A. (2001). Analyzing shared and team mental models. *International Journal of Industrial Ergonomics* 28:99-112.
- Lim, C.S., Mohamed, M.Z., (1999). Criteria of project success: an exploratory re-examination. *International Journal of Project Management* 17 (4), 243–248.
- Lynam, T., & Brown, K. (2012). Mental models in human–environment interactions: theory, policy implications, and methodological explorations. *Ecology and Society*, 17(3).
- McComb, S.A. (2007). Mental model convergence: the shift from being an individual to being a team member, in: F. Dansereau, F.J. Yammarino (Eds.), *Multi-Level Issues in Organizations and Time*, Emerald Group Publishing, pp. 95–147.
- Mohammed, S.; Ferzandi, L.; Hamilton, K. (2010) Metaphor no more: a 15-year review of the team mental model construct, *J. Manage.* 36, 876–910.

- Munns, A.K., Bjeirmi, B.F., (1996). The role of project management in achieving project success. *International Journal of Project Management* 14 (2), 81–88.
- Newman, M., Robey, D., (1992). A social process model of user–analyst relationships. *MIS Quarterly* 16 (2), 249–266.
- Pinto, J.K., Mantel, S.J. (1990). *The Causes of Project Failure*. 8.
- Rickheit, G.; Sichelschmidt, L. (1999). Mental models: some answers, some questions, some suggestions. Pages 9-40 in G. Rickheit and C. Habel, editors. *Mental models in discourse processing and reasoning*. Elsevier, Amsterdam, The Netherlands.
- Schwalbe, K., (2007). *Information Technology Project Management*, fifth ed. Course Technology, Boston, MA.
- Senge, P. (1990). *Peter Senge and the learning organization*.
- Serrador, P., Pinto, J.K. (2015) Does Agile Work? A Quantitative Analysis of Agile Project Success. *International Journal of Project Management*, 33 (5), Pp. 1040-1051
- Shenhar, A.J. (2001) One Size Does Not Fit All Projects: Exploring Classical Contingency Domains. *Management Science*, 47 (3), Pp. 394-414
- Shenhar, A.J. (2004). *Strategic Project Leadership®* Toward a strategic approach to project management. *R&D Management*, 34(5), 569-578.
- Shenhar, A.J., Dvir, D., & Levy, O. (1997). Project success: a multidimensional, strategic concept. In *Innovation in Technology Management. The Key to Global Leadership. PICMET'97* (p. 391). IEEE.
- Shenhar, A. J., Dvir, D., Levy, O., & Maltz, A. C. (2001). Project success: a multidimensional strategic concept. *Long range planning*, 34(6), 699-725.
- Shenhar, A.J., Tishler, A., Dvir, D., Lipovetsky, S. and Lechler, T. (2002), “Refining the search for project success factors: a multivariate, typological approach”, *R & D Management*, Vol. 32 No. 2, pp. 111-126.

- Shenhar, A.J., & Dvir, D. (2007). Reinventing project management: the diamond approach to successful growth and innovation. *Harvard Business Review Press*.
- Sterman, J.D. (2001). System dynamics modeling: tools for learning in a complex world. *California management review*, 43(4), 8-25.
- Stork, D., Sapienza, A.M., (1995). Uncertainty and equivocality in projects: managing their implications for the project team. *Engineering Management Journal* 7 (3), 33–38.
- Tishler, A., Dvir, D., Shenhar, A., Lipovetsky, S., (1996). Identifying critical success factors in defense development projects: a multivariate analysis. *Technological Forecasting and Social Change* 51, 151–171.
- Toor, S. R., Ogunlana, S. O. (2010). Beyond the ‘iron triangle’: Stakeholder perception of key performance indicators (KPIs) for large-scale public sector development projects. *International journal of project management*, 28(3), 228–236. doi:10.1016/j.ijproman.2009.05.005
- Tukel, O.I., Rom, W.O., (2001). An empirical investigation of project evaluation criteria. *International Journal of Operations & Production Management* 21 (3), 400–416.
- Turner, J.R., (2009). *The Handbook of Project-Based Management*, third edition. McGraw-Hill, New York.
- Turner, R. (2015). Re: Project success and stakeholders [Email sent to Kate Davis; 11th March 2015].
- Turner, J.R., Zolin, R., (2012). Forecasting success on large projects: developing reliable scales to predict multiple perspectives by multiple stakeholders over multiple time frames. *Proj. Manag. J.* 43 (5), 87–99.
- Van den Bossche, P.; Gijssels, W.; Segers, M.; Woltjer, G.; Kirschner, P. (2011). Team learning: building shared mental models, *Instr. Sci.* 39 283–301.
- Vandermerwe, S., & Rada, J. (1988). Servitization of business: adding value by adding services. *European management journal*, 6(4), 314-324.

- Vargo, S. L., & Lush, R. F. (2004). Evolving a services dominant logic. *Journal of marketing*, 68(1), 1-17.
- Yu, X., & Petter, S. (2014). Understanding agile software development practices using shared mental models' theory. *Information and software technology*, 56(8), 911-921.
- Yuan, H. (2017). Achieving sustainability in railway projects: Major stakeholder concerns. *Project Management Journal*, 48(5), 115-132.
- Wagner, W., and N. Hayes. (2005). *Everyday discourse and common sense: the theory of social representations*. Palgrave Macmillan, New York, New York, USA.
- Walz, D.B., Elam, J.J., Curtis, B., (1993). Inside a software design team: knowledge acquisition, sharing, and integration. *Communications of the ACM* 36 (10), 62– 77.
- Warner, N.; Letsky, M.; Cowen, M. (2005). Cognitive model of team collaboration: macro-cognitive focus, in: *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, Sage Publications, pp. 269–273.
- Wateridge, J., (1998). How can IS/IT projects be measured for success? *International Journal of Project Management* 16 (1), 59–63.
- Winter, M., & Szczepanek, T. (2008). Projects and programmes as value creation processes: A new perspective and some practical implications. *International Journal of Project Management*, 26(1), 95-103.

APENDIX C

A THEORETICAL FRAMEWORK PROPOSITION TO SUPPORT VALUE CONSTRUCTION BASED ON STAKEHOLDERS' PERCEPTIONS AND SHARED MENTAL MODELS' THEORY

Abstract

Customer and value have gained more and more importance in projects and fostering changes in the project management. Consequently, the value must replace the product as the central focus of the projects. Adaptive methodology is naturally more suitable to the value-centric paradigm but is not suitable to all kinds of projects. Thus, the classical project management methodology, plan-based, must be chosen in some kind of projects. But bring the customer closer to the project team in plan-based methodologies is not so natural, compared to adaptive methodologies. Agile practices can be embodied in the plan-driven methodology forming a hybrid configuration to fill in this gap, but organizations facing difficulties to choose the suitable agile practices depending on the context involved. This paper proposes a framework based on shared mental model's theory to help project managers to assess the agile practices and choose the most suitable ones to foster a shared understanding of the taskwork and teamwork, enhancing the team performance.

Keywords: Framework; Shared mental models' theory; Value-centric paradigm; Agile practices; Hybrid configuration; Value stream.

1. Introduction

The management of projects has given great emphasis on the client organization, considering the client as the owner of the project (Smyth & Lecoivre, 2015). Moreover, supplier and client organizations need to develop and reinvent their business model in order to create value for all relevant stakeholders of a project (Laursen & Svejvig 2016).

Value, outcome, and benefits are interrelated concepts used concerning project success. According to Smyth and Lecoivre (2015), value is the result of benefits realization by the project's outcome, in a medium- and long-term perspective. This broader conceptualization of value in the project context is compatible with the Service Dominant Logic (SD-L) (Vargo & Lusch, 2004).

It is consensus in the literature that the project front-end is a strategic stage (Kim & Wilemon 2002; Williams & Samset 2010; 2013). Morris (2013) argues that the project lifecycle must have a broader view, as the benefits which will generate value to main stakeholders is configured at the project front-end and generated by the project outputs. Thus, the front-end stage needs to be connected with the back end of the asset delivered by the project in order to address the value propositions at the front-end of a project (Fuentes et al., 2019).

Although, projects are naturally embedded in uncertainties due to its intrinsic characteristics, the project team normally considers a perfect future (Pitsis et al., 2003) to forecast the value of the outcomes (Fuentes et al., 2019). As the world is becoming more and more complex, project managers are experiencing a growing number of complex situations and the classical project management methods seems to be inefficient to deal with such a non-deterministic paradigm (Daniel & Daniel, 2018). This argumentation of Daniel and Daniel (2018) corroborates with Smyth and Lecoivre (2015), as projects largely do not meet mandatory goals, and the overall value created is inadequate for the involved constellation of actors (Normann and Ramirez 1993).

The term value is not new in the project's environment. Value can be obtained by comparing project benefits and project disadvantages, considering the lifecycle of the asset (product or service) generated by the project (Ahola et al., 2008; Zwikael & Smyrk, 2012). Some stakeholders may assess the success of a project based on the value delivered by its outcome, looking from a higher-level strategic view, while other stakeholders may focus more on the output-related features (Chang et al., 2013). However, the multiple stakeholders have different perceptions of the value realized, influenced by the project characteristics, project stage in the lifecycle, and their roles in the project (Chang et al., 2013).

Consequently, new forms to address value are necessary on project research and practice (Smyth & Lecoivre, 2015). Daniel and Daniel (2018) recommend a contingent approach based on mental models' theory to deal with this context of complexity and uncertainty in which the projects are involved.

As explained by Davidson (2002), the gap between different perceptions is a complex result of social shaping as much as understood needs because it is the consequence of the different backgrounds of the multiple stakeholders. Individuals' personal life experiences, perceptions, and understandings of the world are the ground of a construct named mental model (Johnson-Laird, 1980). Even our own decisions are influenced by mental models, according to Peter Senge (1990): "mental models are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take actions" (p56).

The theory of shared mental models broadens the individual's mental model theory. Team assumes the role of physical system when talking about shared mental models (Jonker et al., 2011). According to Cannon-Bowers et al. (1993), shared mental model is the "knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task and, in turn, to coordinate their actions and adapt their behavior to demands of the task and other team members" (p.228).

Cannon-Bowers et al. (1993) point out that shared mental models is suitable to explain how teams are able to cope with difficulties and changing task conditions, as the teammates have the necessary knowledge to rapidly and properly react when novel events happen. Thus, the team becomes better prepared to understand current events, take decisions, and consider possible consequences in the near future (Mohammed et al., 2010). According to Jonker et al. (2011), shared mental models are therefore suitable to explain how the comprehension of the task to be executed and of the involved teamwork contributes to the team performance improvement.

Based on the previous argumentation, the following research question is established to guide this paper: **How to use shared mental models' theory to support value construction, during project execution, based on stakeholders' perceptions?**

The main target of the theoretical framework presented in this paper is to support value construction during project execution, considering the multiple stakeholders' perceptions of value realized grounded on their individual mental models. This main objective is divided in three secondary objectives:

- Present a broader understanding on how different concepts are interrelated in the value management, based on the value stream (Davies, 2004; Morris, 2013), system lifecycle (Arto et al., 2016), and transitions between lifecycle phases (Locatelli et al., 2020).
- Present the mental models' theory as the base to explain why and how multiple stakeholders have different perceptions of the value realized by the projects.
- Propose an artefact to support the value construction during project execution, considering the multiple stakeholders' perceptions of value realized, grounded on their individual mental models.

The application of the proposed framework aims to support the reduction of the perceptions gaps among multiple stakeholders, during project execution, promoting a shared understanding of the tasks to be done and of the team skills. The framework will support the project manager to choose the most suitable agile practices in plan-driven projects, creating a hybrid configuration. The role of the agile practices in this context is to promote a common understanding of the tasks to be executed and of the team skills, with the objective of maximizing the value construction and reducing the value slippage.

These academic contributions include a broader understanding of how project management practices influence the value management concerning the value stream (Davies, 2004; Morris, 2013) and the system lifecycle (Arto et al., 2016), created to adapt the project management to the Service Dominant Logic paradigm. Another academic contribution is the explanation of how these concepts are interrelated to manage the value during the system lifecycle (Arto et al., 2016). Finally, the application of mental models' theory to explain the reasons that leave multiple stakeholders to have different perceptions of the value realized completes the academic contributions.

Concerning the contributions to practitioners, the understanding of how project management practices influence the value management during project execution can support project managers to reduce the value slippage and maximize the value creation and co-creation during project execution. The understanding of the different value perceptions of multiple stakeholders, through mental models' theory, can help project managers to take better decisions, during project execution, prioritizing the outcomes, based on a better understanding of the benefits expected by the end-users of the project's asset. Finally, the application of shared mental models' development cycle to evaluate and chose the most suitable agile practices, concerning the project context, can help project managers to reduce the perception gap when a classical project management methodology (plan-driven) must be adopted.

This article is structured in 5 sections. Section 2 presents a theoretical background review about the theory necessary to ground the discussion. The proposed framework is described in section 3 and discussed in section 4. To close this paper, the conclusion, limitations, contributions are presented in section 5.

2. Theoretical background

This section does not have the objective of cover all the available literature about the themes here discussed. The objective here is to present a theoretical background sufficient to support the discussions on the theoretical framework proposed.

2.1. Changing to the new paradigm of value centric

The focus of the projects has changed from product to value delivery, following a movement of change started in the marketing field, going from product dominance towards service predominance. Vandermerwe and Rada (1988) introduced the term “servitization of business”, according to which corporations were adding value to their core corporate offerings through “bundles of customer-focused combinations of goods, services, support, self-service, and knowledge” (p.316). This movement of servitization changed the emphasis from the products selling (single transaction focus – product centric) toward services realization based on physical products (lasting relationship focus – service centric) (Vargo & Lusch, 2004).

Based on this movement of servitization, Vargo and Lusch (2004) presented a new dominant logic for marketing, denominated Service Dominant Logic (SD-L), prioritizing the long-term partnership in the place of a unique transactional relationship between supplier and customer. The relational focus of SD-L is grounded on the individual perception of benefits that can be generated. The proposed value is then transformed in value-in-use (Grönroos & Gummerus 2014), replacing the value-in- exchange of the product-centric paradigm.

Project management has adapted to the paradigm of SD-L. According to Winter and Szczepanek (2008), project management approach should change its focus towards value and benefits delivery to organizations, in a stronger strategic approach. The concern with the capital asset has been gradually replaced by the challenge of implementing the business strategy, improving organizational effectiveness, and managing the stakeholders’ benefits (Winter & Szczepanek, 2008). The emphasis goes towards a more strategic project management,

increasing the integration between the projects with business strategy (Morris & Jamieson, 2004; Brady et al., 2005; Levine, 2005; Ward, 2005).

Looking from this strategic and integrated perspective, delivering the outcome as specified, on time, and increasing value delivery to shareholders is no longer enough to consider a project successful, as previously already predicted by Cohen and Graham (2001). The recommendation is to replace the product (product-centric) by the value (value-centric) as the project's focus, emphasizing the value to be constructed (Zwikael, 2008). Consequently, value creation becomes a new dimension of project success, combined with the traditional iron triangle (cost, time, and scope), assuming a relevant and central position, and becoming the focus of corporate strategy (Normann & Ramirez, 1993; 1994).

The organizations must stop to create value to their customers and transform them to the main stakeholder of the projects, mobilizing them to create their own values from the benefits generated by projects (Normann, 2001). More than mobilize the customers to actively participate in the value creation, Winter and Szczepanek (2008) propose a resignification of the business concept incorporating the customer of the customer (a second level of customer) in the perspective of project success. Thus, the customer stop being a "receiver" of the value delivered by the project and becomes a co-producer and co-designer of value creation.

In this new way of seen projects, value ceases to be delivered and is made available by the projects to be carried out in operation stage. As Morris (2013) explain, the value to be generated by a project emerges in the front-end phase, as an estimation, early in the portfolio management. This value proposition is modified during project execution and is, in fact, realized during the operation stage until the end of the product's lifetime. The value can even assume negative figures, as normally occurs on the nuclear plants or dams decommissioning (Invernizzi et al., 2019).

2.2. Understanding output, outcome, success, benefits, and value

Sometimes outputs and outcomes seem difficult to be differentiated. While outputs are typically tangible and easy to measure, the outcomes of a project are typically intangible and harder to measure. Turner (2015) makes a real distinction between project output and project outcome: the former has an 'operational' perspective, focused on the result of the project implementation, while the second has a 'strategic' perspective, focused on the result from the project implementation phase. In other words, the outputs are directly produced by the project and can be measured immediately when the project is closed, while the outcomes represent the

reason why a project is executed but are not necessarily achieved when the project activities are closed, and outputs are measured.

This distinction between output and outcome can be extended to the project success discussion. In this context, output relates to the project implementation performance, or the 'project management efficiency', while outcome concerns the project benefits performance, or the 'project success' (Cooke-Davies, 2002; Serrador & Turner, 2015; Turner & Zolin, 2012). Thus, the project success results from the benefits realization by the asset produced by the project. Project management efficiency cannot be ignored, but it is not the only important dimension of the project success. Project success assessments are still related to time and budget concerns (Alami, 2016). However, many projects can run over time and budget and been considered successful if they produce value for their organization (Turner & Xue, 2018).

Despite the term "value" is not new in the project management context, its definition is still not clear, and the concept of value has been used interchangeably with the benefits and the values outcomes concepts (Fuentes et al., 2019). Winter et al. (2006) explains that value has multiple meanings across the literature, but its creation is often extended over long-term, thus projects need to prioritize project's outcomes rather than its outputs. APM (2012) has a clear definition of value: "In value management terms value is defined as the ratio of satisfaction of requirements over use of resources" (p.244). Morris (2013) is more synthetic: "Value can be defined as the quotient of function/cost or quality/cost, performance/resources or similar" (p.83). Smyth and Lecoivre (2015) differentiates value from outcome and argue that value is proposed in the beginning of the project and delivered during its execution but can be perceived only in the long-term as the benefits provided using the asset delivered by the project.

The issue is that the multiple stakeholders do not value all dimensions of equal importance to achieve project success and therefore, relevant dimensions varied between stakeholders' groups with different perspectives (Davis, 2016). Thus, success means different things to different people (Freeman & Beale, 1992). Turner (2015) affirms that there is no consensus among stakeholders about success dimensions, as long as they give different level of importance to each criterion. Thus, success criteria must reflect different interests and viewpoints, as project outcome is assessed differently by the various stakeholders (Shenhar et al., 2002).

2.3. Stakeholder's perception gaps

According to McLeod et al. (2012), the stakeholder provides the final judgement about the success of a project, but it can be perceived as successful by one stakeholder and a failure by another. This echoes the findings by Turner and Zolin (2012) that projects have multiple stakeholders with different perceptions of the success dimensions because they focus on factors related to the criteria they perceive as important, and this criteria changes over time. Davis (2016) argues that the existing methods to measure project success fail to present the stakeholders' perceptions. Thus, more than include multiple stakeholders' point of view on the assessment of a project (Turner & Zolin, 2012; Turner, 2014a, 2014b), this evaluation should be done not only on the project closure, but some months after, when the end user can have multiple perceptions of the benefits realized by the project's outcome.

Consequently, perceptions gaps happen in the understanding of project success, as stakeholders can have different perceptions, both in terms of the importance of the criteria and the performance against the criteria (Dalcher and Drevin, 2003; Turner et al., 2009). Chang et al., 2013 argues that the stakeholder's perceptions of project success are influenced by the project characteristics, project stages, and their roles in the project. Some of stakeholders may assess the success of a project based on the value delivered by its outcome, looking from a higher-level strategic view. At the same time, other stakeholders may focus more on the output-related features. Davis (2014) concluded that the perception of project success by different stakeholders is poor, suggesting that current theories are not translating it into practice.

The perception gaps can appear in the very early stages of the projects, still during the understanding of the customer's requirements (Stork & Sapienza, 1995; Jiang et al., 2002). These perceptions' gaps are resulted by requirements instability (changes made in user requirements over the course of the project) and by requirements diversity (extent to which users differ amongst themselves in their requirements). Residual risks can result from these gaps, which compromise the project performance (both output and outcome) due to risks not brought under control (Jiang et al., 2009).

2.4. Mental models and shared mental models in project management

Johnson-Laird (1983) explains that people reasoning according to possibilities compatible with some premises and with their general knowledge about a physical system, rather than making use of formal rules of inference. In other words, mental models are organized knowledge structures that allow individuals to interact with the environment, draw inferences,

explain the behavior of the world around them, and construct expectations for what is likely to occur next (Johnson-Laird, 1983; Rouse & Morris, 1986).

Jones et al. (2011) point out that the mental model construct can enhance our capacity to understand the motivations for human behavior, where other social science constructs, such as attitudes, values, and beliefs, fail to explain this. Broadening the conclusions of Jones et al. (2011) into the project's environment, it is possible to argue that the mental model construct can give insight into how stakeholders perceive and tend to act toward the context around them. A mental model approach goes beyond stakeholders' preferences, goals, and values associated with a given situation and can provide a rich picture of how stakeholders perceive the value delivered by the projects, which is very important to project managers.

Cannon-Bowers et al. (1993) explain that shared mental models' theory expands the scope of mental models, considering the team as the physical system. Shared mental models therefore is a theory from cognitive psychology that focuses on the thought processes or activities that occur at the team level. While heterogeneity of team members can strengthen a team by leveraging diversity, shared mental models' theory proposes that effective teams need to maintain a shared understanding within the team, essential for accomplish the tasks.

Shared mental models contributes to enhance the team achievements. Many studies have shown a positive relation between team performance and similarity between mental models of team members (Bolstad et al., 1999; Lim & Klein, 2006; Mathieu et al., 2000). Cannon-Bowers et al. (1993) define shared mental models as "knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task and, in turn, coordinate their actions and adapt their behavior to demands of the task and other team members" (p.228). Thus, shared mental model theory offers the mechanisms of adaptability necessary to teams rapidly and efficiently adjust their strategy "on the fly" (Mathieu et al., 2000). This flexibility is very important, as the ability to adapt is an important skill in high-performance teams (Cannon-Bowers et al., 1995; McIntyre & Salas, 1995).

According to literature, teams rely on cognitive processes to build shared mental models (McComb, 2007; Warner et al., 2005; Van den Bossche et al., 2011). Yu and Petter (2014) present four specific and sequential stages in a shared mental model development cycle: Knowing, Learning, Understanding and Executing. In Knowing stage, the teams are encouraged to share individual knowledge with the other teammates. During the Learning stage, the teammates integrate all the metaknowledge obtained in the previous stage to build the team's transactive memory system. During the Understanding stage the team must reach a consensus and create a common shared understanding about tasks to be executed and individual

teammate's abilities. Finally, in the Executing stage, the team is ready to execute the tasks as a team to reach the objectives. The team is capable to respond adaptively, confirming the established shared mental model or, restart another cycle of shared mental model development if novel situations arise (Rentsch & Woehr, 2004; Stout et al., 1999; Marks et al., 2000).

There are two different types of shared mental models developed within a team: shared mental models for taskwork, associated with equipment functioning and likely failures; and shared mental models for teamwork, related to task procedures, likely contingencies, and team interactions (Cannon-Bowers et al., 1993; Mathieu et al., 2000). Taskwork concerns the task or job that the team is to perform, working as a team, such as understanding the goals, complexities, challenges, interdependencies, and procedures of accomplishing tasks execution (Cannon-Bowers et al., 1993). Teamwork, on the other hand, encompasses team interaction: roles and responsibilities of team members, interaction patterns, role interdependencies, and information flow. Teamwork also includes team members characteristics, such as individual background knowledge, preferences, skills, and habits of teammates (Cannon-Bowers et al., 1993; Mathieu et al., 2000). Thus, a shared understanding of the team and of the task that is to be performed contributes to team performance. This implies that team members have a shared mental model (Jonker et al., 2011).

The degree of a shared mental model is also important to the team performance. Mohammed et al. (2000) explain that ideally the shared mental models developed inside a team should reach a certain degree of similarity and accuracy. Similarity is defined as “the degree of consistency among each team members’ mental models in content and/or structure”, while accuracy refers to the degree to which an individual mental model of a teammate is adherent to a “true score”, obtained from an expert, and representative of the objective view of the task and team interaction (Rentsch & Woehr, 2004).

Both at the individual and at the collective levels, facing complexity requires the ability to filter strategically a vast amount of available information, and to integrate this into an implicit or explicit prediction model (Beratan, 2007). The effective functioning of teams requires the existence of a mental model shared by team members (Langan-Fox et al., 2000). A team model is the collective knowledge that team members bring to a specific situation – i.e., the collective understanding that team members share about a specific situation, also termed the ‘team situation model’ (Cooke et al., 2000). Yang et al. (2008) showed that higher shared mental models improved team learning and performance. Xiang et al. (2016) found out that shared mental models have positive impact on the performance of project requirement analysis.

3. Framework description

The framework here proposed (figure 1) is based on the available literature about project management, value stream (Davies, 2004; Morris, 2013), system lifecycle (Artto et al., 2016), project transitions (Locatelli et al., 2020), mental models' theory (Johnson-Laird, 1983) and shared mental models' theory (Cannon-Bowers & Salas, 1993). The framework has two main parts. The first part of the framework deals with value management based on mental models. In the second part, the value gap reduction region is explained in detail, grounded on shared mental model's theory.

3.1. Value management based on mental model and shared mental model's theory

The proposed framework is formed by four tracks: value stream (Davies, 2004; Morris, 2013); system lifecycle (Artto et al., 2016) and project transitions (Locatelli et al., 2020); project management practices; and mental models' theory (Johnson-Laird, 1983). These main concepts are interrelated and exist over a new asset lifecycle. They form the base to understand how the value management happens in the context of projects to realize value through benefits generation.

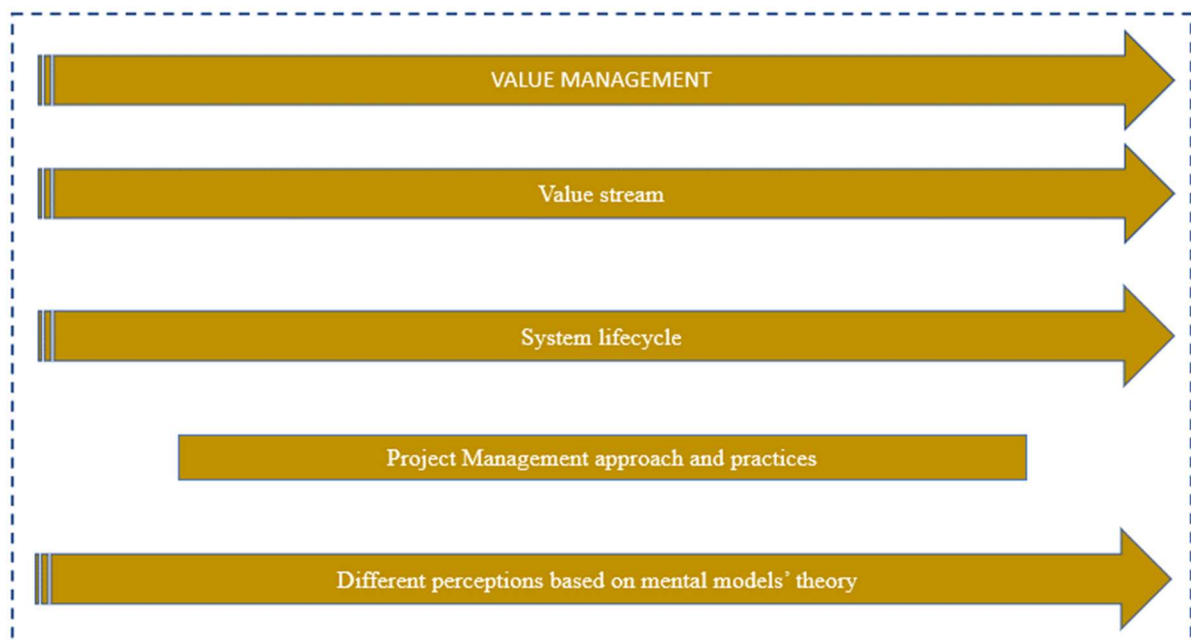


Figure 10 - Value management based on mental models' theory
Source: Author

Figure 10 is a simplification of the framework proposed by the thesis and replaces the original one due to confidential reasons.

The upper track of the framework explains how the value stream, proposed by Davies (2004) and Morris (2013) occurs in an asset lifecycle, seen from the project management point of view. Morris (2013) proposes a broader way of seeing the projects, based on a new value stream, starting before the project kick off and going until the asset created by the project is retired. According to this value driven approach, project management aims adding value rather than just provide cruise control during project execution. As stated by the author, a value proposition emerges in the front-end stage of a project, still during the conception of the project's asset. Then, the value is constructed through a creation and co-creation process, during the project execution stage, based on the benefits expected from the project's outcome. In execution stage, it is recommended that the customer participates of the value construction as a co-creator. Then, the asset, or project outcome, is delivered to the customer by the project closure, when the production stage starts. The value is then realized during asset utilization, through benefits recognition. The last stage is the asset retirement when value decommissioning happens. In this stage the value can eventually assume negative figures (Invernizzi et al., 2019).

The base for the second track of the framework is the "system lifecycle" proposed by Artto et al. (2016) to fit the value stream proposed by Davies (2004) and Morris (2013). The system lifecycle expanded the traditional project lifecycle and is executed as a sequence of four main development stages: (1) strategic planning, which happens during project portfolio management; (2) design and construction or project execution; (3) operations, when the project outcome is used by the customer and/or end-users, generating benefits and value; and (4) decommissioning and replacement, when the asset is retired.

Locatelli et al., (2020) complement the system lifecycle suggested by Artto et al. (2016) with the transitions between development stages. According to Locatelli et al., (2020), the transitions deserve special attention because involve many technical, organizational, economic, and managerial challenges, which can generate a value slippage. The transition between project execution and production stages is the most important one because it is when the project's output is delivered to the customer. Lepak et al. (2007) define value slippage as the part of the initially proposed value not realized during project execution and in the transition from execution to operation.

The bottom track of the proposed framework deals with value perception, based on mental model's theory. Differences in the value perception from multiple stakeholders must be regarded as a natural condition. Davis (2014, 2016, 2018) theorized this focusing on project success perception and Zanicic and Bizarrias (202X) confirmed that multiple stakeholders really have different perceptions, concerning value realization. Stakeholders have different

perceptions of the same thing (whether success or value) because each person has its own beliefs, values, prior experiences, and expectations of what the project will deliver, which are the ground to form individuals' mental models. Mental models are part of the human cognitive process and represent the way an individual interprets the world, take decisions, and predict possible results. Furthermore, individual expectations and perceptions change over time due to new situations or changes on the environment. Thus, mental models are individual and considered complex and dynamic.

Finally, the fourth track of the framework, concerning project management, presents some fundamental practices mentioned by the literature about the themes here discussed. Projects are selected during portfolio management according to proposed value, which is the result of the economic feasibility study. The stakeholders must be managed during the project execution. Vargo and Lusch (2004) propose to have a closer relationship with the customer during project execution in order to co-create value, considering even the customer of the customer. Rai et al. (2009) found that having customer representative as part of project team improve project success by fostering a shared sense of trust, norms, and values.

The management of the risks and the decision-making process are started during the portfolio management (project front-end) and carried out during project execution stage. Decisions and actions taken by managers during project execution result from many interactions between various stakeholders (Daniel & Daniel, 2018). General systems theory revealed that managers interact with projects through decision models (mental models) to take their managerial decisions, but the limitations inherent to human cognition have an impact on how decision-makers face risk and uncertainty (Daniel & Daniel, 2018).

Normally project managers adapt their decision-making approach, according to the levels of complexity and uncertainty involved, with the objective of prioritizing project's outcome and maximizing performance and the value realization. Daniel and Daniel (2018) argue that the classical project management practices do not have the same efficiency in all situations and recommend that project managers adopt a contingent management approach, depending on the level of uncertainty and complexity involved in each project. The authors present two paradigms of project management: the regulation paradigm (deterministic), based on a planning–implementing–controlling cycle; and emergence paradigm (non-deterministic), based on a modelling–experimenting–learning cycle.

Analyzing the requirements gathering process, perception gaps can appear early in the projects, depending on the complexity involved. Perception gaps can appear in the very early stages of the projects, still during the understanding of the customer's requirements (Stork &

Sapienza, 1995; Jiang et al., 2002), and result in residual risks, which compromise the project performance, both output and outcome (Jiang et al., 2009). However, the perceptions gaps can be reduced through a structured communication among stakeholders' groups and across functional boundaries (horizontal coordination), while the effects of the perceptions gaps can be mitigated by an efficient risk management during project execution (Jiang et al., 2009).

In the traditional project management method (plan-driven), the requirements are normally collected and frozen early in the project lifecycle, while in adaptive methodology, the requirements are collected gradually during project execution and small parts of the asset is delivered regularly, in small iterations. Consequently, the benefits realization begins earlier in the adaptive methodology, as small parts of the final asset are delivered to the customer in each iteration. Fine-tune and corrections can be carried out by the project team to minimize value slippage and maximize value realization. This way, there is a continual readiness to "rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment" (Conboy, 2009, p. 235).

The proposed framework adopts the emergence project management paradigm proposed by Daniel and Daniel (2018) as a hybrid arrange of agile practices adopted to complement the plan-driven paradigm. Therefore, the emergence paradigm (Daniel & Daniel, 2018) is more prone to absorb requirements instability and diversity described by (Jiang et al., 2009), adopting the most suitable agile practices, according to the complexity and uncertainty involved. The theoretical region between the full traditional project management methodology (classical project management paradigm) and the full adaptive project management methodology is here denominated a region of value gap reduction, which is discussed in detail in the next topic.

3.2. Value gap reduction zone

Absorbing requirements instability and diversity is not enough to maximize the project outcome and the value realization. The team must work as a team (teamwork) and have a proper understanding of the tasks to be delivered (taskwork) based on the needs of the customers. Langan-Fox et al. (2000) explain that a shared mental model is built within a team and shared by its members, representing the cognition shared among the teammates. Daniel and Daniel (2018) argue that the team model is the collective understanding that teammates share about a

specific situation. Thus, shared mental models is suitable to foster this integration of the team around the tasks to be delivered.

The benefits of adopting shared mental models are also broadly discussed in the literature (Mathieu et al., 2000; Jonker et al., 2011). Specifically in project management world, benefits of shared mental models are known as well. The impact of shared mental models on the team is very positive, improving the understanding of project requirements (Xiang et al., 2016), team learning and project performance (Yang et al., 2008).

Agile practices foster the shared mental models inside the team in different ways. According to Yu and Petter (2014), some agile practices contribute to develop a shared understanding about the tasks to be completed, while other agile practices create shared mental models about team processes and team interactions. Based on these gains, the authors recommend the use of agile practices to enhance the team's shared understanding.

Thus, the aim of the framework presented in figure 2 is to help the team to develop a shared mental model in order to allow teammates to predict what they are going to do and need. The possibility to predict the actions and needs facilitates the coordination of actions between teammates and explain team functioning. Therefore, shared mental models aid describing, explaining, and predicting the behavior of the team, which allows team members to coordinate and adapt easier to changes.

The shared mental model development process, described by Yu and Petter (2014) is the base to foster the necessary taskwork and teamwork mental models. The development process follows four sequential stages, named "Knowing", "Learning", "Understanding", and "Executing". Two possible outcomes result from this development process: reinforcement of the already established shared mental model; or induction to start another round of shared mental model development cycle from the "Knowing" stage. Taskwork and teamwork are the two different types of shared mental models that arise from the development cycle. Similarity and accuracy are degrees of a teamwork shared mental model, which can be assessed.

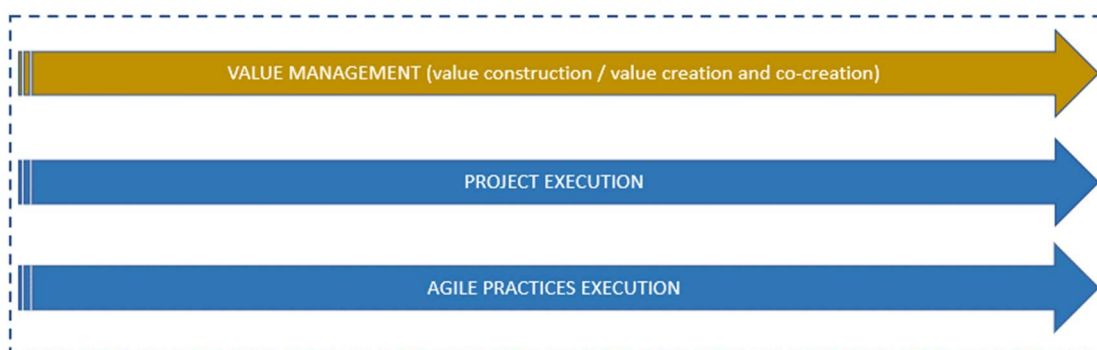


Figure 11 - Value gap reduction region
Source: Author

Figure 9 is a simplification of the framework proposed by the thesis and replaces the original one due to confidential reasons.

As demonstrated by Yu and Petter (2014), agile practices are the tools to operationalize the shared mental model's development. The choice of the most suitable agile practice to be applied depends on its potential contribution to each specific situation. Each agile practice must be assessed under the light of shared mental model's theory prior to be implemented. The two major types of shared mental models above cited (taskwork and teamwork) represent the ground for this assessment.

4. Discussion

The value stream proposed by Davies (2004) and Morris (2013) are the ground to understand how an appropriate value management during project execution can contribute to have a proper value realization by its outcome. Indeed, the value is not delivered to the customer, but is offered, or made available, at the end of the project, to be realized and captured by the customer through the benefits generated by the project's outcome.

This way, projects must be seen as means to construct value. Artto et al. (2016) propose an extended lifecycle, considering a multi-organizational approach. The authors also propose to consider the project execution as part of the asset lifecycle. The transitions between each stage of the system lifecycle are exposed by Locatelli et al. (2020).

The value stream (Davies, 2004; Morris, 2013) is aligned with the paradigm of Service Dominant Logic (SD-L) proposed by Vargo and Lusch (2004), in which the product, as the main asset, is replaced by the service on a long-term relationship with the customer. In this context, the value in exchange, as a result of a single transaction operation, is replaced by the value-in-use, created from a continuous relationship with the customers. Morris (2013) proposes bringing the customer to participate actively in the value creation, as a co-creator, looking to the second level of customer (customer of the customer). Thus, there is a change in progress, in which the focus of the projects moves from the products towards the value. Projects becomes value-centric, instead of product-centric.

The relationship among these concepts is already broadly discussed by the literature, but not yet put together in a framework like is proposed in this paper. The project management practices are applied to put in practice these concepts. During project execution, decisions are taken and must prioritize the outcome, as they are generators of the benefits expected by the

customers and end-users. Decisions and risk management walk together during the project execution.

Risk and uncertainty are normally misunderstood in project management. Systems modelling is one tool to deal with decisions in conditions of uncertainty, because decisions can be tested out with hypothetical consequences (Morecroft, 1983). Daniel and Daniel (2018) argue that mental models (or decision models) can link risk and uncertainty by the capacity to predict future results of decisions.

According to Daniel and Daniel (2018), projects with higher level of complexity and uncertainty configures a non-deterministic paradigm, or emergence paradigm, which can help the project manager in the decision-making process. As argued by the authors, the classical project management is not appropriate in this scenario. But classical project management approach must be adopted in some kinds of projects, creating a dilemma to the project manager. Thus, some alternative must be proposed to fill in this gap.

More than adopt mental models to understand and explain why the multiple stakeholders have different perceptions of value realized by the projects, this framework proposes adopting mental models to help in the decision-make process, filling in the gap indicated by Daniel and Daniel (2018). “If someone has a small-scale mental model of an external reality and of their own possible actions, they are able to define different alternatives, figure out which one is best, respond to future situations before they occur, use knowledge from past events to deal with the present and the future, and react more prudently and skillfully to what emerges” (Craik, 1943, p.329).

Another issue that the proposed framework tries to solve concerns the chosen of the most suitable agile practices to be applied in the emergence paradigm to reduce the multiple stakeholders’ perception gaps during project execution. As proposed by Yu and Petter (2014), the employment of agile practices contribute to develop a shared understanding inside the project team, or a shared mental model. The possibility to assess and choose the most suitable agile practice according to the contingencies, complements the emergence paradigm of Daniel and Daniel (2018).

Organizations normally face challenges in adopting agile practices and tend to abandon or to implement them improperly (Rumpe & Schröder, 2002). Given the multiple agile methodologies and practices available, it is common to adapt rather than implement a full methodology (Yu & Petter, 2014). Thus, it is necessary to understand the value of each practice to have a successful implementation (Yu & Petter, 2014). The proposed framework aims to

support project managers to properly assess and implement the most suitable agile practices, depending on the context.

Mathieu et al. (2000) argue that shared mental models is crucial under critical conditions (difficult communication, excessive workload, time pressure) because allow teammates to act based on their understanding of the task demands and how these will affect their team's response. According to Cannon-Bowers (1993), multiple mental models can be shared among team members, co-existing at a given time.

Finally, this framework is concerned about how value is perceived by multiple stakeholders. Value is the result of the benefits generated by the project's output and outcome and can assume tangible or intangible forms; thus, it cannot be objectively measured. Concerning the traditional project management methodology, value is normally realized after the project is closed and the asset is delivered to the customer. According to Locatelli et al. (2020), this transition from execution to operations stage is the most critical of the system lifecycle because part of the value constructed can slip and not be transformed in value-in-use. Moreover, there is a transition from a temporary to a permanent organization when project execution is terminated, and the operation stage is started. This transition occurs iteratively and more smoothly in adaptive methodologies, as partial deliverables are made during project execution, contributing to anticipate part of the value realization.

As each stakeholder has its own expectations with the project, a consensus about the value realized and the project success seems very difficult, independently of the project management approach adopted. More than having individual expectations with the project, each stakeholder has its own previous experiences, individual values, and beliefs. Johnson-Laird (1980) denominates this construct of individuals' experiences, perceptions, and understandings as mental models.

Mental models are therefore characterized as incomplete and complex representations of reality. Peoples' ability to represent the world accurately is always limited and individual. Mental models are also considered inconsistent representations because they are context-dependent and may change according to the context. In essence, mental models must be highly dynamical models to adapt to continually changing circumstances and to evolve over time through learning. Project managers must deal with this dynamic and complex reality during the whole execution phase, taking decisions and prioritizing the project's outcome, considering the multiple stakeholders' perceptions of value. The framework here proposed aims to support project managers in this context.

5. Conclusion, limitations, and contributions

The conceptual framework proposed by this paper aims to explain how different concepts already discussed by the literature are interrelated and influence the value management. Some gaps appeared when all these concepts were placed together and should be filled in by new propositions. These gaps are grounded on the different perceptions that multiple stakeholders have about the value realized by the projects after its closure. However, value realization depends on an adequate value construction during project execution, which is more difficult when the classical project management methodology must be adopted. The artefact proposed by this paper aims to reduce the gap of value perception in classical project management, focusing on the maximization of value realization. The shared mental models' theory development process is the base of the proposed framework.

Mental models' theory can be used to understand why and how multiple stakeholders have different perceptions of the value realized by the projects. Mental models' theory is also suitable to execute projects with a high level of complexity and uncertainty (emergence paradigm) when the classical project management (regulation paradigm) is normally not efficient enough. Looking to project management practices, the shared mental models' theory proved adequate to assess and choose suitable agile practices to be incorporated in a traditional project management methodology in order to foment a team shared mental model (Yu & Petter, 2014).

As many organizations choose the agile practices subjectively and erratically, face problems with their implementation and are normally not able to realize all the desired benefits. The framework proposed guides the chosen of the most suitable agile practices to reduce the gaps of value perception, fostering a common understanding among the multiple stakeholders through the development of a shared mental model inside the team.

The critical target of project management is to facilitate the value creation during the system lifecycle, as stated by Artto et al. (2016). The role of the project manager and the development team, however, is limited as they act only during the project execution phase. As value is constructed, normally in conjunction with the customer, during execution phase, it is very important that the project manager and the project team can be supported by an artefact to maximize the value to be realized and minimize the value slippage. Mitigating the perception gaps from multiple stakeholders contributes to achievement of this target improving project's outputs and outcomes.

It is very important to validate the proposed framework in practical situations to confirm its applicability and adequate it to real projects. As it was designed to support hybrid arrangements configuration of project management approaches, a plan-driven project is the most suitable scenario to be used to validate and propose improvements. New research on this direction could contribute to the evolution of this framework.

Concerning the contributions to practitioners, the understanding of how project management practices influence the value management during project execution can support project managers to reduce the value slippage and maximize the value construction during project execution. The understanding of the different value perceptions of multiple stakeholders through mental models' theory can help project managers to take better decisions during project execution prioritizing the outcomes based on a better understanding of the benefits expected by the customers and end-users. Finally, the application of shared mental models' development cycle to evaluate and chose the most suitable agile practices, concerning the project context, can help project managers to reduce the value gap when a classical project management methodology is unable to guarantee the necessary efficiency.

The academic contributions include a broader understanding of how project management practices influence the value management concerning the value stream (Davies, 2004; Morris, 2013) and the system lifecycle (Artto et al., 2016), created to adapt the project management to the Service Dominant Logic paradigm. The value stream became clearer, showing how the value is modified along the system lifecycle. This paper also contributes to clarify the relationship between value, benefits, outcome, and project success, which are confused sometimes. The application of mental models' theory to explain the different perceptions of multiple stakeholders concerning the value construction and realization by projects complete the academic contributions.

References

- Ahola, T., Laitinen, E., Kujala, J., Wikström, K., (2008). Purchasing strategies and value creation in industrial turnkey projects. *Int. J. Proj. Manag.* 26, 87–94.
- Alami, A. (2016). Why do information technology projects fail? *Procedia Computer Science*, 100, 62-71.
- APM. (2012). *Body of Knowledge*. 6th Edition. Buckinghamshire: Association for Project Management.
- Artto, K., Ahola, T., Vartiainen, V. (2016) From the Front End of Projects to the Back End of Operations: Managing Projects for Value Creation Throughout the System Lifecycle *International Journal of Project Management*, 34 (2), Pp. 258-270
- Beratan, K.K., (2007). A cognition-based view of decision processes in complex social-ecological systems. *Ecol. Soc.* 12, Art. 27.
- Bolstad, C., Endsley, M. (1999) Shared mental models and shared displays: An empirical evaluation of team performance. *Human Factors and Ergonomics Society Annual Meeting Proceedings* 43(3), 213–217
- Brady, T., Davies, A., Gann, D.M. (2005) Creating Value by Delivering Integrated Solutions. *International Journal of Project Management*, 23 (5), Pp. 360-365. <https://doi.org/10.1016/j.ijproman.2005.01.001>
- Cannon-Bowers, J. A., Salas, E., & Converse, S. A. (1993). Shared mental models in expert team decision making. In N. J. Castellan, Jr. (Ed.), *Current issues in individual and group decision making* (pp. 221-246). Hillsdale, NJ: Erlbaum.
- Cannon-Bowers, I. A., Tannenbaum, S. I., Salas, E., & Volpe, C. E. (1995). Defining team competencies and establishing team training requirements. In R. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations* (pp. 333—380). San Francisco: Jossey-Bass.

- Chang, A.; Chih, Y.Y.; Chew, E.; Pisarski, A. (2013). Reconceptualising Mega Project Success in Australian Defence: Recognising the Importance of Value Co-Creation *Int. J. Proj. Manag.*, 31 (8), Pp. 1139-1153, Doi 10.1016/J.Ijproman.2012.12.005
- Cohen D, Graham R. (2001). *The project manager's MBA*. Jossey-Bass.
- Conboy, K. (2009). Agility from first principles: Reconstructing the concept of agility in information systems development. *Information systems research*, 20(3), 329-354.
- Cooke, N., Salas, E., Cannon-Bowers, J.A., Stout, R., (2000). Measuring team knowledge. *Hum. Factors* 42, 151–173.
- Cooke-Davies, T. (2002). The “real” success factors on projects. *International journal of project management*, 20(3), 185-190.
- Craik, K. (1943) *The Nature of Explanation*, Cambridge University Press
- Dalcher, D., Drevin, L., (2003). Learning from information systems failures by using narrative and antinarrative methods. *The Proceedings of the 2003 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists on Enablement Through Technology*, Gauteng, South Arica.
- Daniel, P. A., & Daniel, C. (2018). Complexity, uncertainty, and mental models: From a paradigm of regulation to a paradigm of emergence in project management. *International journal of project management*, 36(1), 184-197.
- Davidson, E.J. (2002). Technology frames and framing: a socio-cognitive investigation of requirements determination. *MIS Quarterly* 26 (4), 329–358.
- Davies, A. (2004). Moving base into high-value integrated solutions: a value stream approach. *Industrial and corporate change*, 13(5), 727-756.
- Davis, K. (2014). Different stakeholder groups and their perceptions of project success. *International Journal of Project Management* 32 (2014) 189–201.

- Davis, K. (2016). A method to measure success dimensions relating to individual stakeholder groups, *International Journal of Project Management*, 34(3), 480-493, <https://doi.org/10.1016/j.ijproman.2015.12.009>.
- Davis, K. (2018). Reconciling the views of project success: A multiple stakeholder model. *Project Management Journal*, 49(5), 38-47.
- Freeman, M., Beale, P. (1992). Measuring project success. *Proj. Manag. J.* 23 (1), 8–18.
- Grönroos, C.; Gummerus, J. (2014). The service revolution and its marketing implications: service logic vs service-dominant logic. *Manag. Serv. Qual.* 24 (3),206–229.
- Invernizzi, D.C., Locatelli, G., Gronqvist, M., Brookes, N. (2019). Applying value management when it seems that there is no value to be managed: the case of nuclear decommissioning. *Int. J. Proj. Manag.* 37 (this issue).
- Jiang, J.J., Klein, G., Discenza, R., (2002). Perception differences of software success: provider and user views of system metrics. *Journal of Systems and Software* 63 (1), 17–27.
- Jiang, J.J.; Klein, G.; Wu, S.P.J.; Liang T.P. (2009) The relation of requirements uncertainty and stakeholder perception gaps to project management performance. *The Journal of Systems and Software* 82 (2009) 801–808.
- Johnson-Laird, P.N. (1980). Mental models in cognitive science. *Cognitive science*, 4(1), 71-115.
- Johnson-Laird, P.N. (1983). *Mental models: Towards a cognitive science of language, inference, and consciousness* (No. 6). Harvard University Press.
- Jonker, C.M., van Riemsdijk, M.B., Vermeulen, B. (2011). Shared Mental Models. In: De Vos, M., Fornara, N., Pitt, J.V., Vouros, G. (eds) *Coordination, Organizations, Institutions, and Norms in Agent Systems VI. COIN 2010. Lecture Notes in Computer Science* (), vol 6541. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-21268-0_8
- Langan-Fox, J.; Code, S.; Langfield-Smith, K. (2000). Team mental models: techniques, methods and analytic approaches. *Human Factors* 42:242-271.

- Laursen, M., Svejvig, P., (2016). Taking stock of project value creation: a structured literature review with future directions for research and practice. *Int. J. Proj. Manag.* 34 (4), 736–747.
- Lepak, D.P., Smith, K.G. and Taylor, M.S. (2007). Value creation and value capture: A multilevel perspective. *Academy of Management Review*, 32(1), pp.180-194.
- Levine H. (2005) *Project portfolio management*. Jossey-Bass.
- Lim, B., Klein, K. (2006) Team mental models and team performance: A field study of the effects of team mental model similarity and accuracy. *Journal of Organizational Behavior* 27(4), 403
- Locatelli, G.; Zerjav, V.; Klein, G. (2020). Project Transitions—Navigating Across Strategy, Delivery, Use, and Decommissioning. *Project Management Journal*, Vol. 51(5) 467–473 DOI: 10.1177/ 8756 9728 20953976
- Marks, M.A.; Zaccaro, S.J.; Mathieu, J.E. (2000) Performance implications of leader briefings and team-interaction training for team adaptation to novel environments, *J. Appl. Psychol.* 85; 971–986.
- Mathieu, E., Heffner, T.S., Goodwin, G., Salas, E., Cannon-Bowers, J. (2000) The influence of shared mental models on team process and performance. *The Journal of Applied Psychology* 85(2), 273–283
- McLeod, L., Doolin, B., MacDonell, S.G., (2012). A perspective-based understanding of project success. *Proj. Manag. J.* 43 (5), 68–86.
- McIntyre, R. M., & Salas, E. (1995). Measuring and managing for team performance: Emerging principles from complex environments. In R. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations* (pp. 149-203). San Francisco: Jossey-Bass.
- Mohammed, S.; Ferzandi, L.; Hamilton, K. (2010) Metaphor no more: a 15-year review of the team mental model construct, *J. Manage.* 36, 876–910.

- Morecroft, J.D.W. (1983). System dynamics: portraying bounded rationality. *Omega* 11, 131–142.
- Morgan, G. (1988). Accounting as reality construction: towards a new epistemology for accounting practice. *Accounting, organizations, and society*, 13(5), 477-485.
- Morris, P. (2013). Reconstructing project management revisited: A knowledge perspective. *Project Management Journal*, 44(5), 6-23.
- Morris P, Jamieson A. (2004) Translating corporate strategy into project strategy. Project Management Institute.
- Normann R. (2001) Reframing business: when the map changes the landscape. Wiley.
- Normann, R. and Ramirez. R. (1993), “From Value Chain to Value Constellation: Designing Interactive Strategy,” *Harvard Business Review*, 71 (July–August), 65–77.
- Normann R. and Ramirez R. (1994) Designing interactive strategy: from value chain to value constellation. Wiley.
- Rai, A.; Maruping, L.M.; Venkatesh, V. (2009) Offshore information systems project success: the role of social embeddedness and cultural characteristics, *MIS Quart.* 33 (617).
- Rentsch, J.R.; Woehr, D.J. (2004) Quantifying congruence in cognition: social relations modeling and team member schema similarity, in: E. Salas, S.M. Fiore (Eds.), *Team Cognition: Understanding the Factors that Drive Process and Performance*, American Psychological Association, Washington, DC, pp. 11–31.
- Rouse, W. B., & Morris, N. M. (1986). On looking into the black box: Prospects and limits in the search for mental models. *Psychological Bulletin*, 100, 349-363.
- Rumpe, B.; Schröder, A. (2002) Quantitative Survey on Extreme Programming Projects, *Proceedings of XP2002*.
- Senge, P. (1990). *Peter Senge and the learning organization*.
- Serrador, P., & Turner, R. (2015). The relationship between project success and project efficiency. *Project management journal*, 46(1), 30-39.

- Shenhar, A.J., Tishler, A., Dvir, D., Lipovetsky, S. and Lechler, T. (2002), "Refining the search for project success factors: a multivariate, typological approach", *R & D Management*, Vol. 32 No. 2, pp. 111-126.
- Smyth, H., & Lecoivre, L. (2015). Differences in decision-making criteria towards the return on marketing investment: A project business perspective. *International Journal of Project Management*, 33(1), 29-40.
- Stork, D., Sapienza, A.M., (1995). Uncertainty and equivocality in projects: managing their implications for the project team. *Engineering Management Journal* 7 (3), 33–38.
- Stout, R.J.; Cannon-Bowers, J.A.; Salas, E.; Milanovich, D.M. (1999) Planning, shared mental models, and coordinated performance. an empirical link is established, *Hum. Factors* 41 61–71.
- Turner, J.R., (2009). *The Handbook of Project-Based Management*, third edition. McGraw-Hill, New York.
- Turner, J. R. (2014a). *Gower handbook of project management (5th ed.)*. Farnham: Gower Publishing Ltd.
- Turner, J. R. (2014b). *The handbook of project-based management*. Berkshire, UK: McGraw-Hill.
- Turner, R. (2015). Re: Project success and stakeholders [Email sent to Kate Davis; 11th March 2015].
- Turner, J.R., Zolin, R., (2012). Forecasting success on large projects: developing reliable scales to predict multiple perspectives by multiple stakeholders over multiple time frames. *Project Management Journal* 43 (5), 87–99.
- Turner, J.R., Zolin, R., Remington, K., (2009). Modelling success on complex projects: multiple perspectives over multiple time frames. In: Gemuenden, H.-G. (Ed.), *The Proceedings of IRNOP9, the 9th Conference of The International Research Network of Organizing by Projects*, Berlin, June. Technical University of Berlin, Berlin.

- Turner, J.R., & Xue, Y. (2018). On the success of megaprojects. *International Journal of Managing Projects in Business*.
- Van den Bossche, P.; Gijssels, W.; Segers, M.; Woltjer, G.; Kirschner, P. (2011). Team learning: building shared mental models, *Instr. Sci.* 39 283–301.
- Vandermerwe, S., & Rada, J. (1988). Servitization of business: adding value by adding services. *European management journal*, 6(4), 314-324.
- Vargo, S. L., & Lush, R. F. (2004). Evolving a services dominant logic. *Journal of marketing*, 68(1), 1-17.
- Winter, M., & Szczepanek, T. (2008). Projects and programmes as value creation processes: A new perspective and some practical implications. *International Journal of Project Management*, 26(1), 95-103.
- Winter, M., Smith, C., Morris, P. and Cicmil, S. (2006). Directions for future research in project management: The main findings of a UK government-funded research network. *International journal of Project Management*, 24(8), pp.638-649.
- Xiang, C., Yang, Z., Zhang, L., (2016). Improving IS development teams' performance during requirement analysis in project—the perspectives from shared mental model and emotional intelligence. *Int. J. Proj. Manag.* 34, 1266–1279.
- Yang, H.-D., Kang, H.-R., Mason, R.M., (2008). An exploratory study on meta skills in software development teams: antecedent cooperation skills and personality for shared mental models. *Eur. J. Inf. Syst.* 17, 47–61.
- Yu, X., & Petter, S. (2014). Understanding agile software development practices using shared mental models' theory. *Information and software technology*, 56(8), 911-921.
- Zwikael, O. (2008). "Top management involvement in project management: A cross country study of the software industry", *International Journal of Managing Projects in Business*, Vol. 1 No. 4, pp. 498-511. <https://doi.org/10.1108/17538370810906228>
- Zwikael, O., Smyrk, J., (2012). A general framework for gauging the performance of initiatives to enhance organizational value. *Br. J. Manag.* 23, S6–S22.

APENDIX D

Categorização do respondente

Nesta primeira parte da pesquisa queremos saber um pouco mais sobre você. Essas informações são importantes para a análise final dos dados coletados. Não se preocupe porque suas respostas não serão divulgadas nem compartilhadas com ninguém.

Qual a sua idade?

Qual o seu sexo?

1. Masculino
2. Feminino
3. Prefiro não dizer

Qual o seu nível de escolaridade?

1. Ensino médio
2. Ensino superior
3. Pós-graduação lato sensu (especialização)
4. Mestrado
5. Doutorado

Quanto tempo você tem de experiência com gestão de projetos? Considere qualquer função ou papel exercido em algum projeto (0 se nunca esteve ligado à gestão de projetos)

Qual o seu tempo de experiência especificamente como gerente de projetos? (0 se nunca atuou como gerente de projetos)

Categorização do projeto

Nesta etapa precisamos saber um pouco sobre um projeto do qual você tenha participado de alguma forma. Não importa qual foi seu papel nesse projeto. Pode ter sido como membro da equipe, gerente do projeto, executivo de alguma das organizações envolvidas, cliente, usuário ou qualquer outro papel/função. É importante que o projeto já tenha sido encerrado. Não se preocupe porque suas respostas não serão divulgadas nem compartilhadas com ninguém.

Qual foi sua função no projeto em questão?

1. Executivo da empresa que contratou o projeto
2. Executivo da empresa que executou o projeto
3. Gerente do programa ou portfólio do qual o projeto faz parte
4. Investidor (Shareholder)
5. Membro do time de desenvolvimento
6. Gerente do projeto / Scrum Master / Product Owner
7. Cliente
8. Usuário final do produto/serviço entregue pelo projeto
9. Patrocinador do projeto (Sponsor)
10. Other _____

Em qual o setor da economia o projeto melhor se enquadra?

1. Serviços
2. Indústria
3. Tecnologia da informação
4. Infraestrutura
5. Educação
6. Outro _____

Há quanto tempo o projeto foi encerrado?

1. Até 2 meses
2. Entre 2 e 12 meses
3. Entre 13 e 24 meses
4. Acima de 24 meses
5. Não sei dizer

Como você classificaria a complexidade do projeto?

1. Baixa

2. Média

3. Alta

Como você classificaria o posicionamento estratégico do projeto?

1. Mandatório: atender uma norma/regulamentação

2. Imposição da matriz

3. Fundamental para a sobrevivência da empresa

4. É uma melhoria de algum processo interno

5. O objetivo é promover o reposicionamento da empresa no mercado

6. Esse projeto não é estratégico

7. Não sei dizer

Quais pontos eram considerados importantes para o resultado do projeto inicialmente? Pode escolher mais de 1 opção.

1. Tempo

2. Custo

3. Escopo/Qualidade

4. Relacionamento com o cliente

5. Outro _____

Onde se localiza o cliente do projeto?

1. No Brasil

2. Fora do Brasil, em outro país

3. Não sei responder

Como pode ser classificada a equipe de desenvolvimento quanto à sua distribuição geográfica?

1. Equipe local (single site)

2. Equipe multi-localizada (multi site)

3. Não sei responder

Como podemos definir o escopo no início do projeto?

1. Totalmente definido e congelado
2. Parcialmente definido; foi congelado depois do levantamento detalhado dos requisitos
3. Não estava definido, mas foi ficando mais claro na medida em que o projeto foi avançando
4. Não sei responder

Como podemos definir o cronograma no início do projeto?

1. Totalmente definido e data de término estabelecida
2. Parcialmente definido com data de término estimada
3. Não havia um cronograma e a data de término estava indefinida
4. Não sei responder

Como você classificaria o projeto quanto à sua origem?

1. Projeto interno, desenvolvido para a própria organização que o executou
2. Projeto externo, desenvolvido para um cliente fora da organização que o executou
3. Não sei responder

Qual foi o tipo de contrato adotado para o projeto?

1. Preço fixo (valor definido previamente para a execução do projeto)
2. Custos reembolsáveis (remuneração + reembolso dos custos incorridos na execução do projeto)
3. Tempo & Material - T&M (pagamentos mensais com base numa taxa horária previamente definida)
4. Projeto interno. Não houve contrato
5. Outro

Em qual setor da sociedade o projeto está inserido?

1. Público (Estado)
2. Iniciativa Privada
3. Terceiro setor ou de interesse social

Como você classificaria a (%) de hibridismo adotada em relação à metodologia de gestão do projeto? (posicione o cursor na posição que achar mais adequada)

Você considera que esse projeto foi bem-sucedido? Você pode explicar sua resposta, por favor?

Como o valor entregue pelo projeto é entendido por seus stakeholders?

Esta é a última parte da pesquisa. Precisamos saber sua opinião a respeito das afirmações que serão apresentadas a seguir. Considere que a realização de valor ocorre a partir dos benefícios gerados pelos projetos e através da satisfação das necessidades dos diferentes stakeholders.

Desta questão em diante você deve escolher uma das 5 opções de acordo com o seu nível de concordância com cada afirmação apresentada.

(1) O projeto realiza valor quando termina no prazo definido (schedule).

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente

(2) O projeto realiza valor quando seu custo fica dentro do orçamento planejado (budget).

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente

(3) O projeto realiza valor quando os requisitos técnicos e funcionais solicitados no escopo são atendidos.

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(4) O projeto realiza valor quando o cliente fica satisfeito com o produto/serviço entregue.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(5) O projeto realiza valor quando satisfaz as necessidades do time de desenvolvimento.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(6) O projeto realiza valor quando proporciona a aquisição de novos conhecimentos ao time de desenvolvimento, os quais podem ajudar em futuros projetos.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(7) O projeto realiza valor quando os benefícios gerados ao usuário/cliente são justos em relação ao seu preço.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(8) O projeto realiza valor quando o produto/serviço entregue melhora o rendimento dos seus usuários (menos tempo / menor custo / mais fácil de usar).

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(9) O projeto realiza valor quando proporciona ganhos para o acionista da organização.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(10) O projeto realiza valor quando contribuiu para que se crie uma relação de parceria de longo prazo entre a organização e seu(s) cliente(s).

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(11) O projeto realiza valor quando o produto/serviço entregue proporciona um bom resultado comercial.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(12) O projeto realiza valor quando o produto/serviço entregue aumenta a participação da organização no mercado.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(13) O projeto realiza valor quando o produto/serviço entregue cria um novo mercado.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(14) O projeto realiza valor quando cria uma nova linha de produtos.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(15) O projeto realiza valor quando o produto/serviço entregue resulta no desenvolvimento de uma nova tecnologia.

1. Concordo totalmente

2. Concordo parcialmente

3. Neutro

4. Discordo parcialmente

5. Discordo totalmente

(16) O projeto realiza valor quando melhora a capacidade organizacional da empresa.

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente

(17) O projeto realiza valor quando contribui para motivar a organização a executar projetos semelhantes no futuro.

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente

(18) O projeto realiza valor quando o produto/serviço entregue proporciona receita/lucro contínuo para a organização após sua conclusão.

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente

(19) O projeto realiza valor quando o produto/serviço entregue proporciona redução dos custos de operação/manutenção para a organização após a sua conclusão.

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente

Considere para as próximas afirmações que: - O dono (owner) do projeto é a organização que investe ou paga pela sua realização (Turner & Zolin, 2012; Turner, 2014). - O sponsor é a pessoa que provê recursos para a realização de um projeto, contribuindo para que o mesmo atinja os resultados esperados (Morris, 1994). - Contractor é a organização contratada para executar um projeto para outra organização.

(20) O projeto realiza valor quando proporciona benefício para o seu patrocinador (sponsor).

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente

(21) O projeto realiza valor quando proporciona lucro para a organização dona do projeto (owner).

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente

(22) O projeto realiza valor quando gera lucro para a organização contratada para executar o projeto (contractor).

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente

(23) O projeto realiza valor quando os parceiros da organização contratada para executar o projeto ficam satisfeitos com o seu resultado.

1. Concordo totalmente
2. Concordo parcialmente
3. Neutro
4. Discordo parcialmente
5. Discordo totalmente