PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ

ESCUELA DE POSGRADO

Scalable Agile Frameworks in Large Enterprise Project Portfolio Management

TESIS PARA OBTENER EL GRADO DE DOCTOR EN ADMINISTRACIÓN ESTRATÉGICA DE EMPRESAS

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Dedication

I dedicate this effort to God because He made the success of this project possible. To the people I adore the most, are and will be my worthy inspiration: my grandparents Ana Francisca and Hernán, who are like my parents; my aunt Cecilia, who is like my mother; my family who always goes with me, and my limited and valuable friends with whom we walk together, they trust in my leadership and are a seal of loyalty and confidence.

Acknowledgements

I would like to express my gratitude to CENTRUM PUCP Business School and its authorities for accepting me in their classrooms. I would also like to thank my advisor, friend, and professor Dr. Carlos Arturo Hoyos Vallejo who accompanied me guided me and taught me with valuable knowledge and commitment during the execution of this project. To the Director of Doctoral Programs, Dr. Rubén Guevara, who always supported me, trusted me, and praised my work as a student; and, on several occasions, he proudly highlighted in his class my advances during this research. To all the professors of this wonderful institution who were behind this process of personal and professional development, to its General Director, Dr. Percy Marquina, for his leadership in sustaining CENTRUM PUCP in the top of best business schools in the world.

In addition, I would like to thank my company Lite Thinking and its work team because they contributed to this research idea and accompanied me in the development of my dissertation project. Once again, I would like to thank my grandparents, my aunt, my family, and all those who contributed with their grain of sand in this academic and investigative process.

Abstract

With an exploratory study scope, due to little research and in an emerging state, the purpose of the research was to explore the implementation of scalable agile frameworks in project portfolio management (PPM) of large enterprises. This qualitative case study posed as its primary research question: How and why are scalable agile frameworks implemented in the PPM of large companies? Further, this study used the purposive sampling method and the snowball technique. Data were collected from 59 project portfolios in 22 companies with agile and scalable agile framework implementations in the information technology (IT), financial and telecommunications industries in Mexico, Colombia, Peru, Ecuador, Costa Rica and Chile, through 43 semi-structured in-depth interviews. The findings reveal that there are project portfolios with high variability in service, product and innovation, and with hybrid implementations of Scaled Agile Framework (SAFe), Spotify Model and Scrum. In addition, they face different challenges related to the implementation of scalable agile frameworks in PPM, organizational culture, resistance to change, and strategic leadership. Similarly, the findings demonstrate that agile frameworks are a viable option to optimize time-to-market, increase team productivity and improve communication across the board. This study represents one of the first to explore how large companies implement scalable agile frameworks in PPM to fill the gap in the literature related to how and when companies should approach an agile transformation process working successfully in their PPM. Accordingly, this study provides empirical evidence from six Latin American countries as a potential basis for future research and publications.

Keywords: agile project management, project portfolio management, Scaled Agile Framework (SAFe), organizational transformation, project management.

Resumen Ejecutivo

Con un alcance de estudio exploratorio, debido a que se ha investigado poco y se encuentra en un estado emergente, el propósito de la investigación fue explorar la implementación de los marcos ágiles escalables en la gestión del portafolio de proyectos (PPM) de grandes empresas. Además, este estudio de caso cualitativo planteó la siguiente pregunta principal de investigación: ¿De qué manera los marcos ágiles escalables se implementan en la PPM de grandes empresas, y por qué? Este estudio recopiló información de 59 portafolios de proyectos en 22 empresas con implementaciones de métodos ágiles y marcos ágiles escalables de las industrias tecnologías de la información (IT- por sus siglas en inglés), financiera y telecomunicaciones, de México, Colombia, Perú, Ecuador, Costa Rica y Chile, mediante 43 entrevistas en profundidad semiestructuradas. Los hallazgos revelan que existen portafolios de proyectos con alta variabilidad en servicio, producto e innovación, y con implementaciones híbridas de Scaled Agile Framework (SAFe), Spotify Model y Scrum. Además, enfrentan diferentes desafíos relacionados con la implementación de los marcos ágiles escalables en la PPM, la cultura organizacional, resistencia al cambio y liderazgo estratégico. Del mismo modo, los hallazgos demuestran que los marcos ágiles son una opción viable para optimizar el time-to-market, aumentar la productividad de los equipos y mejorar la comunicación a nivel general. Este estudio es uno de los primeros en explorar cómo implementan las grandes empresas los marcos ágiles escalables en la PPM para llenar el vacío en la literatura relacionado con cómo y cuándo las empresas deben abordar un proceso de transformación ágil que funcione de manera exitosa en su PPM. Por lo tanto, este estudio proporciona evidencia empírica de seis países latinoamericanos como base potencial para futuras investigaciones y publicaciones.

Palabras clave: gestión de proyectos ágiles, gestión de portafolio de proyectos, Scaled Agile Framework (SAFe), transformación organizacional, gerencia de proyectos

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Introduction

This dissertation is organized into two chapters. On the one hand, the first chapter presents the research paper entitled "Scalable Agile Frameworks in Large Enterprise Project Portfolio Management", which was accepted for publication by the European Research on Management and Business Economics (ERMBE) on October 05th, 2022 (see Appendix A). This submission is required to complete the degree of *Doctor en Administración Estratégica de Empresas* granted by the Pontificia Universidad Católica del Perú through its graduate school in business management, CENTRUM PUCP. Additionally, this journal is part of the Scopus database, in quartile Q1. On the other hand, the second chapter sets out the main conclusions and recommendations of the dissertation.

The literature review map in this study provides the connections among the concepts based on previous bibliographic references (see Appendix B). This conceptual overview includes trends, gaps, and the need for studying Scalable Agile Frameworks in Project Portfolio Management (PPM) of large companies. Project management (PM) theory is established as a strategic tool for companies in different industries. However, research on this discipline gave rise to PPM, considered a more strategic and higher-level function than PM, although the two of them are interdependent (Brady & Davies, 2004; Keegan & Turner, 2002; Larson, 2004). PM is characterized by its principles of rigor with a sequential and linear method of steps to develop a project life cycle (Benington, 1983; Royce, 1987; Bick et al., 2018). Due to the demands of accelerated changes in the software industry, PM has achieved a level of flexibility (Gothelf, 2017; Leffingwell, 2011, 2018) thanks to the contribution of agile project management (APM- for short) in uncertain environments (Conforto et al., 2016; Chin, 2004).

APM describes the agile methods that emerged from agility applied in the PM field (Cohn, 2005; Erickson et al., 2005). This approach was designed for small and individual

teams, a single team, and co-located teams consisting of up to nine or a maximum of 11 collaborators (Batra, 2020; Bick et al., 2018; Conforto et al., 2014; Diker et al., 2016; Marinho et al., 2021). In large companies around the world, interest is growing in the implementation of agile methods in their projects, which are themselves part of a PPM (Bass & Haxby, 2019; Gandomani et al., 2020; Hobbs & Petit, 2017; Hansen & Svejvig, 2022; Stettina & Horz, 2015). Over the past decade, scalable agile frameworks have emerged as a container that gathers best practices of agile methods to provide a more far-reaching solution for the integration of several projects or programs of a PPM. (Kantola et al., 2022; Marnewick & Marnewick, 2022; Kula & Deursen, 2022).

Scalable agile frameworks are approaches to scale agility in large companies and combine agile and Lean practices to meet the real needs of industries (Ebert & Paasivaara, 2017). These needs arise in large companies committed to an agile transformation involving the organizational integration of various projects and programs into portfolios (Niederman et al., 2018). In addition, companies that implement scalable agile frameworks in PPM achieve better fulfillment of performance and their objectives, such as refined speed and quality (Hobbs and Petit (2017). Also, they achieve superior alignment with a strategy for frequent deliveries and continual deployments of their projects (Paasivaara et al. (2018).

Scalable agile frameworks gather the best recommendations for implementing agile methods in the PPM of large companies (Alqudah & Razalim, 2016; Dolman & Spearman, 2017). According to technical and functional reviews by consultants and researchers, SAFe framework with the highest adoption (Alqudah & Razali, 2016; Digital.ai., 2021; Dolman & Spearman, 2017) achieves better comprehensiveness and coverage for the portfolio level. The SAFe framework was based on Kotter's change management model (Kotter, 2012) and Lean (Ries, 2018), Scrum (Schwaber, 2004), XP (Beck, 1999), Kanban (Anderson, 2010), DevOps

(Kim et al., 2016), Desing Thinking (Cooper et al., 2014) and other practices, and consolidated Enterprise Architecture (Bloomberg, 2013).

Scalable agile frameworks provide flexible and adaptable environments for complex and finite-precision projects, delivering the product or service in an incremental manner with continuous feedback loops (Amorima et al., 2020; Gustavsson et al., 2022). These incremental deliveries require integrating simultaneously a shift in mindset and strong organizational structures to enforce quality practices (Saarikallio & Tyrväinen, 2022). Recent studies demonstrate that the practices of agile methods and scalable agile frameworks can complement established software engineering practices to ensure high-quality project deliverables (Alami & Krancher, 2022).

Empirical evidence indicates that there are multiple potential benefits of implementing scalable agile frameworks in the PPM of companies to become more customer-centric, reduce time-to-market, increase revenue growth, lower costs, and attract more competitive staff (Conboy & Carroll, 2019; Jorgensenn, 2019). However, besides the benefits and challenges in the implementation, this evidence is in its beginning and in an emerging state (Beecham et al., 2021; Conboy & Carroll, 2019; Dingsøyr et al., 2019; Marinho et al., 2021; Kowalczyk et al., 2022).

Several researchers have stated the importance of studies to be conducted regarding scalable agile frameworks in the PPM of large companies to (a) consider multiple projects with a variety of organizational structures (Conforto et al., 2016; Tallon et al., 2019); (b) explore the implementation of these frameworks in PPM (Hobbs & Petit, 2017); (c) develop case studies on the implementation of scalable agile frameworks, such as SAFe, in the PPM of large companies (Paasivaara et al., 2018; Conboy & Carroll, 2019; Dingsøyr et al., 2019; Kowalczyk et al., 2022), consistent with the relevance of the topic (Dikert et al., 2016); (d) guide large companies in the early identification and management of challenges amid an agile

transformation (Conboy & Carroll, 2019; Dingsøyr et al., 2019; Sweetman & Conboy, 2018), and (e) add to the limited empirical evidence on the implementation of scalable agile frameworks in large companies (Beecham et al., 2021; Marinho et al., 2021). Consequently, there are evident gaps (Beecham et al., 2021; Conboy & Carroll, 2019; Dingsøyr et al., 2019), which had not yet been addressed by other research in detail. To support the need for this study, Table 1 provides a synthesis of the gaps in the literature review.

Table 1

Gaps in the literature review

Author	Year	Summary
Beecham et al.	2021	There is little empirical evidence on the practices of scalable agile frameworks to mitigate risk, especially in global software projects where failure is a common problem.
Conboy & Carroll	2019	Previous research has presented some success factors and recommendations for the implementation of scalable agile frameworks in large enterprises. However, more empirical evidence on agility in larger environments or enterprises is suggested.
Dikert et al.	2016	It proposes conducting more in-depth case studies to gain a better understanding of agile transformations in large companies, how they are used in practice, and how they can be adapted.
Dingsøyr et al.	2019	It is suggested that researchers provide relevant recommendations through empirical studies for the implementation of scalable agile frameworks in large enterprises. Also, it is important for researchers to understand the basic theory behind scalable agile frameworks to further extend them.
Hobbs & Petit	2017	It advocates conducting studies on the implementation of agile methods and scalable agile frameworks in PPM.
Lappi et al.	2018	This study not only brings new insights into the field of agile project management and software engineering, but also encourages academics to further research on this topic in other contexts.
Marinho et al.	2021	Research with distributed agile teams is recommended to understand if SAFe practices are used in large enterprise projects.
Niederman et al.	2018	Current literature is oriented to the individual and team/project levels. Qualitative studies on large projects in greater depth and studies on the implementation of scalable agile frameworks in portfolios and programs are being proposed.
Paasivaara et al.	2018	More case studies on agile transformations in large enterprises are suggested since research in this area is scarce. Studies to demonstrate the advantages of scalable agile frameworks indicated by consultants and interesting to companies, such as SAFe, LeSS and DAD.

Stettina & Horz	2015	The line of research on the implementation of scalable agile frameworks in PPM is encouraged to gain a better understanding of the interaction of agile practices with agile roles.

This research addressed the gaps in the literature as a contribution to knowledge since it explored the implementation of scalable agile frameworks in the PPM of large companies. This contribution provides an understanding of how and when companies should approach an agile transformation process by successfully working on their PPM. In this way, the qualitative case study formulated the following main research question: How and why are scalable agile frameworks implemented in the PPM of large companies? Furthermore, in the literature review, four sub-questions allowed to answer the main one in a systematic way: RQ1: How are the characteristics of project portfolios that are managed under scalable agile frameworks defined (Stettina & Horz, 2015)? RQ2: How do companies initiate an agile transformation and who is responsible for this process (Paasivaara et al., 2018)? RQ3: How are the reported challenges in companies that implement scalable agile frameworks explained? And RQ4: Why should companies implement scalable agile frameworks (Dikert et al., 2016)?

As sampling techniques, this research utilized purposive sampling and the snowballing technique. 35 Latin American companies in Mexico, Colombia, Peru, Ecuador, Costa Rica, and Chile were contacted, and 22 of them were selected according to the confirmation and availability of their leaders. A total of 43 semi-structured in-depth interviews were conducted from August to November 2021, for approximately one hour and forty-five minutes, and 4,297 minutes of recorded material. During the interview sessions, 59 project portfolios were identified in the areas of IT, finance, Merchandising, commercial and sales, business and innovation, and product.

The interviews followed the five phases defined by Kallio et al. (2016): identifying prerequisites, retrieving and using prior knowledge, formulating the preliminary guide, pilot testing, and presenting the complete semi-structured interview guide. A semi-structured interview guide was developed during the execution of the research as a useful tool for future research (see Appendix C). The information gathered was triangulated with data obtained from field notes and important supporting documents, which ensured data convergence and counteracted potential biases in the study (Yin, 2018). All the findings were stored in a structured database demonstrating a chain of evidence of the entire research (Yin, 2016).

As Yin (2018) argues, the purpose of multiple case studies lies in the possibility of making analytical or theoretical generalizations rather than statistical generalizations; i.e., identifying and replicating theoretically significant situations across several cases. Thus, the findings and conclusions in this research meet this methodological requirement as they are based on patterns observed and partly contrasted across a set of 59 cases, as well as supported by theory and previous research achieving internal validity and reliability of the study (Ritchie & Lewis, 2013).

This research used the method of thematic analysis, which involved cross-checking or triangulation to achieve study reliability (Creswell, 2018). Also, it followed the guidance of grounded theory to code qualitative data in ATLAS.TI v8 (Yin, 2016). Coding was further refined when contrasting categories with theory from previous research and additional information gathering. In this sense, critical challenges were identified and grouped into five categories. The coded themes were mentioned in the transcripts 178 times. Thus, it was recognized that 33% were related to organizational culture; 24% to resistance to change; 19% to strategic leadership; 15% to shortage of knowledge and skills; and 9% to inconsistency of processes. Benefits were also identified and grouped into four categories, and organizational aspects were divided into five categories.

The main findings of this research exhibit that there are project portfolios with high variability in service, product, and innovation in large companies with hybrid implementations of scalable agile frameworks. In addition, this study shows that companies face challenges in implementing scalable agile frameworks in PPM, organizational culture, resistance to change, and strategic leadership. Agile frameworks were found to be a viable option to reduce time-to-market, increase team productivity and improve communication across the board. Among the most desired frameworks are SAFe, Spotify Model, and Scrum, with hybrid adaptations and integrations of their agile practices to meet the needs and evolution of the business dynamics contained in PPM.

The findings of this research indicate that teams are not fully dedicated to project portfolios in 79% of cases. The identified cases in these companies have a balanced matrix organizational structure whereby agile team members are part-time with low to moderate resource availability. In the practical context of the companies, these results are not aligned with previous research recommendations, which suggest dedicated, self-managed, and self-organized teams (Cervone, 2011; Chin, 2004; Highsmith, 2004). In the other cases studied, their organizational structure is a strong matrix in which their teams are full-time with moderate to high resource availability.

This study revealed that the implementation of scalable agile frameworks is being done without assessment of strategy, growth, experimentation, and scaling. Subsequently, the results generated superficial adoptions in companies deprived of assessment criteria, such as those proposed by Alqudah and Razali (2016), Dolman and Spearman (2017), and Dingsoeyr et al. (2019). This fact produces a lack of awareness by companies about the real strengths, weaknesses, and opportunities in practice that scalable agile frameworks partake in a specific business situation, as pointed out by Dingsoeyr et al. (2019).

In accordance with previous research (e.g., Dikert et al., 2016; Dingsoeyr et al., 2019; Conboy & Carroll, 2019; Marinho et al., 2021; Paasivaara et al., 2018; Rufo-McCarron, 2018), this research demonstrated that agile methods and scalable agile frameworks are a viable option to reduce time to market, increase team productivity, improve overall communication and foster adaptation to change in companies. However, it is suggested to perform a continuous prioritization process based on their criticality, value generation, and alignment with the strategy to enable companies to have a centralized and optimized portfolio (Knaster & Leffingwell, 2020). The companies studied use unclear investment prioritization and selection mechanisms, which create several portfolios with multiple projects, including finite human capital capacity. As a result, this can lead to non-transparent resource allocation (Krebs, 2008; PMI, 2017).

This study explored the implementation of scalable agile frameworks in the PPM of large companies identifying 59 project portfolios in 22 Latin American companies. Consequently, this study sets forth contributions to the APM approach, as well as PM theory since APM is involved in PM in uncertain environments (Conforto et al., 2016; Chin, 2004):

- This research is one of the first to explore how large companies implement scalable agile frameworks in PPM.
- This study fills the gap in the literature linked to how an agile transformation is performed by estimating five challenges, four benefits and five organizational aspects, and covering the characterization and configuration of the project portfolio in practice.
- This research provides in-depth empirical evidence from six Latin American countries on the implementation of scalable agile frameworks in PPM.

This empirical evidence offers new knowledge and relevant recommendations on the application of scalable agile frameworks. Not only within large Latin American companies in practice, but also in those with the same characteristics. This finding exposes the adaptation of

scalable agile frameworks in certain contexts to achieve their benefits and better interaction between agile practices with agile roles.

This research has theoretical implications for academia and practical implications for large companies seeking the potential benefits of scalable agile frameworks. Moreover, the findings suggest management development on the part of companies to promote better knowledge and skills development of collaborators to lead and organize a successful agile transformation through six key aspects:

- **Hybrid models:** The high variability of project portfolios in large companies requires hybrid schemes or models of various scalable agile frameworks to make their own adaptations to the needs of the companies.
- **Project portfolio prioritization:** A rigorous investment prioritization and selection process must be in place to have a single strategic portfolio as the focus of the entire company.
- **Agile practices:** Agile practices should be initiated at the individual and team/project levels so that their benefits spread in programs and portfolios with distributed agile teams in a controlled manner.
- **People:** The agile transformation requires complete focus on the people of the companies because they are the engine of the transformation and the results of the scalable agile frameworks will depend on the training, coaching and constant accompaniment of these teams to mitigate the challenges of the change of leadership, self-management and self-organization.

a) **Anticipated investments:** The top management of companies should consider important anticipated investments in training, capacity building, and physical and technological infrastructure to achieve in the short or medium term the benefits of an agile transformation based on the implementation of scalable agile frameworks.

b) **Transition:** Experimentation with pilot projects becomes the best experience to extend and propagate successful results in other areas of the companies.

Chapter I: The Research Article

The research article "Scalable Agile Frameworks in Large Enterprise Project Portfolio Management" was accepted for publication on October 05th, 2022 in the European Research on Management and Business Economics (ERMBE), with ISSN: 2444-8834. This journal is indexed in the Scopus database in quartile Q1, and it has an Impact Factor 4.75. ERMBE is an international peer-reviewed open access journal whose articles are related to any specialization in Business Economics.

Scalable Agile Frameworks in Large Enterprise Project Portfolio Management

Abstract

Purpose - Our article explores the implementation of scalable agile frameworks in the project portfolio management (PPM) of large companies, to understand how and when companies should approach an agile transformation process that works successfully in their PPM.

Design / methodology / approach - We use the qualitative case study to analyze the portfolios of projects with implementations of scalable agile frameworks in large companies. We studied 59 project portfolios in 22 companies and conducted 43 semi-structured in-depth interviews.

Findings - We found portfolios of projects with high variability in service, product, and innovation, and with hybrid implementations of Scaled Agile Framework (SAFe), Spotify Model and Scrum; as well as different challenges related to the implementation of scalable agile frameworks in PPM, organizational culture, resistance to change and strategic leadership. Our findings demonstrate that agile frameworks are a viable option for fast time-to-market, increasing team productivity, and improving overall communication.

Research limitations / implications - Given that we addressed 59 portfolios of projects in large companies, the analytical generalizations allowed us to identify and verify theoretically significant patterns that can only be applied in this type of company, and not in SMEs.

Practical implications - Our findings suggest the need for managerial development that promotes a broader orientation of scalable agile frameworks in PPM, specifically, better knowledge and skills about implementing these frameworks in companies to lead and organize an agile transformation. successful.

Originality / value - Our study adds to the already limited knowledge about how companies identify and manage challenges they may be susceptible to during planning or how to anticipate in practice in the midst of an agile transformation.

Keywords: Agile project management, Project portfolio management, Scaled Agile Framework (SAFe), Organizational transformation, Project management.

Paper type Case study

Introduction

The agile project management (APM) approach has contributed significantly to the way of developing software (Meyer, 2014). Although initially the agile methods focused on a single small team made up of up to nine collaborators (Batra, 2020; Conforto et al., 2014); success stories have led to their implementation in geographically distributed global projects (Dikert et al., 2016; Paasivaara et al., 2018; Stettina & Horz, 2015), and in projects with multiple teams grouped in a project portfolio management (PPM) in large companies (Bass & Haxby, 2019; Gandomani et al., 2020). Consequently, several researchers proposed the application of agile methods in these types of companies, through the implementation of scalable agile frameworks (Batra 2020; Nguyen et al., 2018) such as: Scaled Agile Framework (SAFe) (Knaster & Liffingwell, 2020); Spotify Model (Kniberg & Ivarsson, 2012) and Large Scale Scrum (LeSS); in order to facilitate business management in complex environments and face different challenges during an agile transformation (Russo, 2021) such as: resistance to change, lack of investment, coordination of multiple teams (Paasivaara et al., 2018, Rufo-McCarron, 2018), top management support (Kasauli et al., 2021), and limited client collaboration (Dingsøyr et al., 2019). Despite this, large companies continue to find it difficult to implement scalable agile frameworks in PPM, and to lead and organize a successful agile transformation (Beecham et al., 2021; Conboy & Carroll, 2019; Hobbs & Petit, 2017; Marinho et al., 2021; Sweetman & Conboy, 2018). Additionally, studies on the implementation of scalable agile frameworks in PPM are scarce (Beecham et al., 2021; Hobbs & Petit, 2017; Kasauli et al. 2021; Marinho et al., 2021; Sweetman & Conboy, 2018); these studies are in an emerging state and

show the lack of advice, about how and when large companies should approach an agile transformation process that works successfully in their PPM (Conboy & Carroll, 2019; Dingsøyr et al., 2019). Indeed, existing research are strongly oriented to study the implementation of agile methods in software development projects with individual teams and located in the same place (Azanha et al., 2017; Kettunen & Laanti, 2008), which becomes a major obstacle, whenever large companies want to achieve the benefits that agile methods have achieved in projects and individual teams. For example, better productivity, cost reduction, alignment of requirements and minimization of time to market (TTM) (Russo, 2021).

In this sense, this study aims to explore the implementation of scalable agile frameworks in the PPM of large companies, and answer the following research question: How and why are scalable agile frameworks implemented in the PPM of large companies? To answer it in a systematic way, we asked four sub-questions. RQ1: How are the characteristics of project portfolios that are managed under scalable agile frameworks defined? RQ2: How do companies initiate an agile transformation and who is responsible for this process? RQ3: How are the reported challenges in companies that implement scalable agile frameworks explained? RQ4: Why should companies implement scalable agile frameworks?

As a research strategy, we used the case study in Latin American companies that have implementations of scalable agile frameworks or some of their methods (Alqudah & Razali, 2016). We interviewed 43 leaders of the highest level of responsibility and governance of the PPM in 22 companies to explore their experiences in the use or application of agile frameworks in the context of 59 project portfolios. We provided in-depth explanations and meanings of the scalable agile frameworks in those 22 companies to strengthen their implementation in the PPM, and thus achieve significant economic results in a reasonable time. Our contribution to knowledge focuses on three aspects, from the perspective of scalable agile frameworks in PPM. First, we present the potential characteristics of project portfolios managed with scalable agile frameworks and an overview of project portfolio setup in practice. Second, we present the challenges related to implementing scalable agile frameworks in PPM and their candidate strategies to address the identified challenges. Third, we present the benefits and organizational aspects that motivate companies to implement scalable agile frameworks in PPM. The structure of the article is as follows. In the next section we present the review of the academic literature; then, the methodology we used; in the next section, the results of the study, and finally, we discuss the results and present our conclusions, limitations, and recommendations for future studies.

Literature review

APM

Agility applied in the field of project management (PM) emerged in the late 1980s and early 1990s (Conforto et al., 2016; Takeuchi & Nonaka, 1986), enlightened mainly with studies focused on software projects, such as those made by Eisenhardt and Tabrizi (1995), who found that product development arises in a way that is more uncertain than predictable, more experimental than planned, and more iterative than linear or sequential. Subsequently, it was found that these projects not only involve innovation but require great flexibility and agility due to dynamic and changing environments (Alqudah and Razali, 2016). Furthermore, agility is a relatively new paradigm that is presented as a solution to maintain competitive advantage in times of uncertainty and turbulence (Sharifi & Zhang, 2001). In this sense, it is understood as the organizational capacity to create and respond to change, seeking to obtain benefits in turbulent environments (Highsmith, 2002); be prosperous, increase their competitiveness (Booth, 1994; Nagel & Dove, 1991), and respond quickly, in a balanced, flexible, and stable manner (Erickson et al., 2005; Highsmith, 2002; Vokurka & Fliedner, 1998). The first agile methods were: Scrum (Schwaber & Beedle, 2001); Lean Software Development (Poppendieck & Poppendieck, 2003); Crystal (Cockburn, 2004); Feature-Driven Development (FDD) (Palmer & Felsing, 2002); Adaptive Software Development (ASD) (Highsmith, 2002); Dynamic Systems Development Method (DSDM) (Stapleton, 1997); and Extreme Programming (XP) (Beck, 1999). These methods were implemented in software projects, and from the results obtained, the agile manifesto was created in 2001 (Larman, 2004), composed of four values and 12 principles that propose a common framework for all agile methods (Leffingwell, 2011). This new approach allowed the replacement of traditional software development (Digital.ai., 2021), based on top-down planning, with complex process management, with an emphasis on detailed specifications and a comprehensive initial design (Bick et al., 2018). Therefore, the agile approach is described as flexible (Smith, 2007), adaptive (Cervone, 2011), iterative and extreme (Beck, 1999; Cervone, 2011), and includes other methods that are derived from the agile manifesto, such as: Kanban Software Development (Anderson, 2010), Scrumban (Corey, 2009); and Scrum / XP Hybrid (Augustine, 2008), among others.

Later, other researchers adopted the term agile project management (APM) to describe the agile approach (Highsmith, 2010), which was designed to respond to the great challenges of the software industry and is used to implement flexibility in the process project management (Lindvall et al., 2004). Flexibility is achieved through a set of principles, values, and practices, which help the team to deliver products or services of value in projects in challenging environments (Highsmith, 2002), by carrying out activities that are simplified and with better adherence to uncertain environments and in constant change (Chin, 2004). To achieve this, they integrate clients in a continuous process of learning and adaptation, considering the needs and the environment (Augustine, 2005). These needs require practices that facilitate the adoption of agility, not only in project teams,

but also in other areas of the company (Highsmith, 2010). The implementation of agile practices in companies not only ensures that the project team adapts quickly to the uncertainties and accelerated changes that projects require, but also that risks are minimized thanks to short interactions, defined deliverables and direct communication with stakeholders, generating trust in project management (Cervone, 2011). Consequently, the objective of the APM is to make the project management process simple, flexible, and iterative, improving performance (cost, time, and quality), reducing effort, and achieving higher levels of innovation and added value for the client (Conforto & Amaral, 2010). Indeed, the APM has become a contribution to the PM in uncertain environments (Conforto et al., 2016; Chin, 2004); and has added additional practices (e.g., organizational routines of the team through recurring micro-activities), which suggest its constant application to improve communication and alignment in projects (Pentland & Feldman, 2007).

However, although agile practices are difficult to adopt in large companies with well-established routines and structures that last over time (Stettina & Horz, 2015), it is important to consider that improving project performance and increasing the productivity of your teams are important considerations for applying agile practices in large companies, and in broader contexts, such as portfolios and programs (Niederman et al., 2018). Indeed, proper selection given the variety of agile methods remains a challenge for most organizations trying to implement agility (Recker et al., 2017). However, given that agility in PM began in software development projects with individual teams, recent research highlights the idea that, to obtain a better explanation of APM, it is essential to develop research in the broad context of companies (Conforto et al., 2016).

PPM

In addition to consolidating itself as a strategic tool for companies from different industries, the PM theory is characterized by its principles of rigor, because it requires a sequential and linear method of steps to develop the life cycle of projects (Benington, 1983; Bick et al., 2018). Research in this discipline gave rise to the PPM, which is considered a more strategic and higher-level function than the PM, although the two are interdependent (Brady & Davies, 2004; Keegan & Turner, 2002). PPM is a set of projects linked to a time-related business cycle, such as an annual plan (Cooper 1999; Ferns, 1991). The PPM aims to allocate portfolio resources, prioritize, select, integrate, manage, and control projects and programs that add value to the organization (Nguyen et al., 2018). It also establishes as objectives: to maximize the financial values of the portfolio, link the company's strategy with the portfolio, and balance the project within the portfolio with respect to the organization's capabilities (Martinsuo and Lehtonen, 2007). Therefore, project managers must be concerned with the interests of the organization beyond individual projects, seeking to share PPM decisions with top management and middle leaders; and in this way, establish links between their projects and management (Müller et al, 2008).

Since PPM is a collection of unique, concurrent, and competitive projects; not only is the participation of senior management necessary, mainly in the allocation of resources (Archer & Ghasemzadeh, 1999); rather, a strong alignment between the PPM and the organizational directives must be guaranteed (Roussel et al., 1991). This alignment is evident when adding all the projects in a portfolio because it represents the investment strategy of the organization (Dye & Pennypacker, 1999), and gives it the opportunity to be more agile, beyond individual projects; therefore, these investments need to be continuously optimized to implement the strategy effectively (Herfert & Arbige, 2008). It should be noted that the investments made in a portfolio must start from a dynamic decision-making process in which new projects and programs are evaluated, selected, prioritized, and balanced in the context of those existing within the portfolio (International Project Management Association [IPMA], 2018). These portfolios can be implicit within one division of the organization or be implemented throughout it (IPMA, 2018). However, given that there may be several project portfolios, -which are usually managed centrally- (Kerzner, 2017; Project Management Institute [PMI], 2017), this situation can lead to an untransparent allocation of resources (Krebs, 2008; PMI, 2017).

Although it is true that the application of the PPM characteristics implies having a portfolio of agile projects, whose success and performance are guaranteed by practices that provide teams with freedom, authority, and the ability to produce tangible value for the client (Lappi et al., 2018); the complexity of its implementation is presented in the need to reconcile the tensions between the client's needs and the organizational strategy (Sweetman & Conboy, 2013). This circumstance generates a weaker relationship between agile projects and organizational strategy, than the one that usually occurs between traditional projects and organizational strategy (Lappi et at., 2018; Sweetman and Conboy, 2018). However, the APM developed -in the past decade- scalable agile frameworks to be implemented in large projects, usually grouped in portfolios (Stettina & Horz, 2015) such as SAFe (Knaster & Leffingwell, 2020), Scrum-of-Scrums (SoS) (Sutherland, 2001), Enterprise Scrum (Beedle, 2019) and Spotify Model (Ambler & Lines, 2012). As a result of this effort, base documents with high tools for these frameworks emerged; however, these are not enough, and there is still a lack of empirical evidence that allows guiding large companies in their agile transformation processes (Conboy & Carroll, 2019; Dikert et al., 2016; Dingsøyr et al., 2019; Paasivaara et al., 2018).

Scalable Agile Frameworks implemented in PPM

Scalable agile frameworks arose because of projects that successfully applied agile methods in small companies and due to the great interest of large companies in achieving the same results in more complex projects (Niederman et al., 2018). These frameworks are approaches that not only allow scaling agility in large companies, but also facilitate combining agile practices with Lean to meet the real needs of industries (Paasivaara et al., 2018). The question then arises: what is meant by large scale? According to Dikert et al. (2016) the concept of large scale should be applied to software development organizations with more than 50 people or, at least, six teams of average size of six to seven people. In this regard, Dingsøyr et al. (2019) considered that speaking on a large scale refers to projects with more than two development teams that include many actors. However, to scale agility in organizations it is necessary to consider several factors: team size, geographic distribution, ingrained culture, system complexity, legacy systems, regulatory compliance, organizational distribution, degree of governance and business focus (Ambler, 2008). The scalable agile frameworks with the greatest presence in organizations are SAFe, SoS, Enterprise Scrum and Spotify Model (Digital.ai., 2021). Table I presents a brief description of the agile frameworks currently used by companies.

The foundation of all scalable agile frameworks is the practices of agile methods, especially Scrum. Most companies initiate an agile transformation with Scrum, and then implement agile practices at the enterprise scale using some scalable agile framework. SAFe is the only framework with the best level of integrity and coverage for the portfolio level (Alqudah & Razali, 2016; Dolman & Spearman, 2017). SAFe has three levels: portfolio, essential and large solution (Knaster & Leffingwell, 2020), which are grouped into four settings: Essential, Portfolio, Large Solution, and Full, allowing you a degree of flexibility at deployment time. SAFe functions as a container of good practices that include Enterprise Architecture (Coplien & Bjornvig, 2010), Development and Operations (DevOps) (Kim et al., 2017) and Desing Thinking (Cooper et al., 2014). SAFe is the main framework that shows progress in covering its deficiencies (Dingsøyr et al., 2019), and is the most requested by large companies (Alqudah & Razalim, 2016; Digital.ai., 2021; Dolman & Spearman, 2017; Hemon et al., 2020). However, they continue to face great challenges during the implementation process, mainly related to resistance to change, lack of investment and coordination of multiple teams (Paasivaara et al., 2018, Patanakul & Rufo-McCarron, 2018), unconsciousness about the need to change and evolve (Kasauli et al., 2020).

Scalable Agile Framework	Description
SAFe	It is a framework for *Lean* companies that describes various practices for implementing agile methods at an enterprise scale (Knaster & Leffingwell, 2020).
SoS	It is a framework presented by Sutherland (2001) as a technique for scaling *Scrum* in large teams (more than a dozen people)
Discipled Agile Delivery (DAD)	It is a hybrid agile approach geared towards people and learning to deliver Information Technology (IT) solutions (Ambler & Lines, 2012).
Spotify Model	This model was developed by the company Spotify and uses the concept of *Squads* to name a *Scrum Team, Tribes* to group *Squads, Chapter* to group competitions of a *Tribe* and *Guilds* to group people who want to share knowledge in a specific area (Kniberg & Ivarsson, 2012),
Large Scale Scrum (LeSS)	It is *Scrum* applied to several teams working together on a product (Larman & Vodde 2017). These researchers stated that *LeSS* has two frames: *LeSS* between two and eight teams and *LeSS Huge* with more than eight teams.
Enterprise Scrum	It is an improvement of *Scrum* that allowed it to be generalized in all types of domains and scale it in any initiative and organization of any size (Beedle, 2019).
Agile Portfolio Management	It proposes the management of a dynamic portfolio based on agile principles with flexible financial models (Krebs, 2008).
Nexus	It targets the core of scalability by minimizing dependencies between teams and integration problems (Bittner *et al*., 2017).
Recipes for Agile Governance (RAGE)	It divides the levels of government into portfolio, program, and project, and suggests appropriate practices for each level (Thompson, 2013).
Scrum at Scale	It allows *Scrum to* scale and has components that allow an organization to customize its transformation and implementation strategy (Sutherland, 2019).

Table I. Scalable Agile Frameworks implemented in the PPM

It is noteworthy that although there is a growing implementation of various scalable agile frameworks in large companies, there is still little empirical evidence of their agile practices in risk mitigation, and primarily, in projects in which failure is a recognized problem; therefore, more extensive research is needed on scalable agile frameworks in the PPM for large enterprise (Beecham et al., 2021). Therefore, based on this limited evidence from studies, as well as the effectiveness and challenges of these frameworks in an emerging state in companies (Conboy & Carroll, 2019; Dingsøyr et al., 2019; Marinho et al., 2021), we consider it appropriate to pose the following research question: How and why are scalable agile frameworks implemented in the PPM of large companies? Likewise, we pose four sub-questions based on the following knowledge gaps. Stettina & Horz (2015) recommended further research on the characteristics of a PPM with agile projects. RQ1: How are the characteristics of project portfolios that are managed under scalable agile frameworks defined? Paasivaara et

al. (2018) recommended carrying out case studies on agile transformations in companies. RQ2: How do companies initiate an agile transformation and who is responsible for this process? Dikert et al. (2016) stressed the importance of scientifically studying scalable agile frameworks. RQ3: How are the challenges reported in companies that implement scalable agile frameworks explained? And RQ4: Why should companies implement scalable agile frameworks?

Research method

Our study is exploratory in scope, because scalable agile frameworks are in their infancy in companies, so there is little scientific evidence in the literature (Beecham et al., 2021; Marinho et al., 2021). In view of the fact that our study contributes to the APM approach and the agile practices of its emerging frameworks in a real context in which events cannot be controlled, we opted for the case study, because it allowed us to explore in depth (Yin, 2018) and within the context of large companies the phenomenon of the implementation of scalable agile frameworks in PPM, and being able to make an important contribution to the literature and theories related to the research problem (Carminati, 2018). In addition, researchers such as Azanha et al., (2017); Dikert et al., (2016) and Paasivaara et al., (2018) recommended conducting qualitative case studies on the implementation of scalable agile frameworks in companies. Because these studies are based on practice, it is possible to explore the functional and everyday environment of project portfolios, which are characterized by being increasingly complex, dynamic, and interconnected (Clegg et al., 2018). In this sense, we study several cases to guarantee a stronger effect in the research (Yin, 2016), and to ensure the variability and understanding of the phenomenon from different perspectives (Creswell, 2018). We use the purpose sampling method and the snowball technique (Saunders et al., 2016), to ensure the selection of cases and the sample within the case.

Case Selection

Our study has a holistic design that understands the global nature of the phenomenon, represented by the portfolio of projects of a large company, -as a single unit of analysis- (Yin, 2018). The portfolios of projects analyzed have the implementation of scalable agile frameworks, such as SAFe, or some of its adopted methods and practices (Alqudah & Razali, 2016). Since some companies use different terminologies for the project portfolio, we use the definition of IPMA (2018) and PMI (2017), namely: a set of projects associated with a portfolio. This set of projects are considered strategic in nature and belong to a time-related business cycle, such as an annual plan (Cooper 1999; Ferns, 1991). In accordance with Flyvbjerg (2006), we select extreme, critical, pragmatic, and maximum variation cases until reaching the data saturation level. We selected two types of companies with experience in the development of large-scale projects and using scalable agile frameworks: companies with at least three years of experience and companies with more than eight years of experience; all of them with more than 250 employees and developing multiple projects with a variety of organizational structures (Stettina & Horz, 2015).

To guarantee the variability of the cases we identified large companies from different industries in Latin America with various project portfolios by using different avenues: LinkedIn, international symposia on agility, networking in Scaled Agile courses, consulting companies, and references from master students and well-known executives. We contacted 35 companies and selected 22 from the confirmation and availability of their leaders. Participants are leaders of the highest level of responsibility and governance of PPM in companies, with roles as Agile Coach, Scrum Master and Portfolio Manager. We conducted 43 interviews between the months of August and November 2021, with an approximate duration of one hour and forty-five minutes, and 4,297 minutes of recorded material. During the interview sessions, we were able to identify several project portfolios that respond to the organizational strategy (Kerzner, 2017), and we collected data from 59 project portfolios.

Data Collection

We used semi-structured in-depth interviews as the main source of information, which allowed us to collect enriched data while maintaining flexibility during the application, as it is an exploratory study (Stettina & Horz, 2015), and having close contact with the participants (Taylor, 2005), who are leaders of the highest level of responsibility and governance of the PPM with extensive knowledge and expertise in agile transformations. We conducted the interviews following the five phases defined by Kallio et al. (2016): identification of prerequisites, recovery and use of previous knowledge, formulation of the preliminary guide, pilot test, and complete presentation of the semi-structured interview guide. Considering these phases, we developed a semi-structured interview guide. Questions were added during the field work, from the analysis of the results of each interview carried out, with the intention of exploring new topics not initially considered; because it is the most effective way of interviewing because it facilitates a deeper and more common understanding of the subject matter (Corbetta, 2003).

We highlight as main topics questions related to demographic information, general PPM questions, strategic management of the project portfolio, governance of the project portfolio and portfolio value management. Some examples of these questions are: Why did your company initiate an agile transformation? How are project portfolios prioritized and selected? What lessons learned have been converted into actions to be implemented in future project portfolios, and why?

We used the technique of videoconferencing with the Google Meet platform, and we recorded them with the consent of the participants who were present throughout the interview and delved into the topics with the highest level of knowledge. To verify the correct interpretation of the information provided (Brinkmann & Kvale, 2018) we verified the existence or not of inconsistencies in the information provided by the participants during the data collection exercise. We triangulated the data obtained with field notes and important supporting documents for the interviews, guaranteeing the convergence of the data and counteracting possible biases in the study (Yin, 2016).

Data Analysis

We carried out the data collection and analysis processes in an interleaved and iterative way, according to the recommendations of the thematic analysis method, which involved cross-verification or triangulation to achieve the reliability of the study (Creswell, 2018). We addressed four phases in its development. First, we transcribed the interview recordings and field notes, organized the memories in the research database, and explored meanings, recurring themes, and patterns in the data. Second, we decomposed the compiled data into smaller code snippets, following grounded theory guidelines for encoding qualitative data (Yin, 2016). Additionally, we reviewed the academic literature to refine this encoding in ATLAS.TI v8. Some code examples were: connect strategy with execution, align PPM with strategy, and improve delivery times. Third, we identified the categories and concepts related to the research questions, to find patterns between the codes and to draw inferences and explanations. Fourth, we refined the new concepts that emerged, the collection of additional information, and the academic literature through the review of the previous phases, to understand and interpret the findings and conclusions. In this phase we included different guidelines for the analysis of these issues: contrast between the cases; comparison of cases and their relationship with demographic aspects, and relationship between the concepts and the formulation of questions about them (Bazeley & Jackson, 2013).

The ATLAS.TI v8 tool contributed to the transparency, systematization and structuring of the analysis process through the application of its main components (Woolf & Silver, 2017). In addition, following the recommendations of Langley (1999) for the construction of the theory, we selected the visual mapping strategy using the ATLAS TI v8 network diagrams for each case of the study, with the purpose of communicating knowledge, verifying the existence of inconsistent statements, and check the correct interpretation of the information provided by the participants. The semi-structured in-depth interviews continued until the new cases did not generate additional information (Charmaz, 2014).

Results

Table II shows the main variables observed and the scalable agile frameworks related to the PPM of the companies. We replaced company names with letter codes between A and V, for privacy and ethical considerations. Next, we described the characteristics of the project portfolios of the companies included in the study.

Case Projects Portfolios

Most of the project portfolios that were part of the research belong to companies in the IT, financial and telecommunication industries, mainly from Mexico, Colombia, and Peru; while three project portfolios belong to companies from Ecuador, Costa Rica, and Chile (Table II).

Cases		Implementation										Leaders	
Company	Industry	# portfolios	# Projects	Agility experience (Years)	Scrum	XP	Kanban	ScrumBan	Spotify Model	SAFe	LeSS	# Interviews	Roles
A	Financial	11	350	8	X					X		5	CEL, AC, RTE, RTE, HSD
B	Retailer	4	59	4	X					X		5	SDIT, SITM, LSE, LSE, MPM
C	Financial	1	5	5	X		X			X		1	AC
D	Financial	5	160	3	X					X		1	PM
E	IT	1	40	5	X		X			X		1	DCE
F	IT	1	78	16	X	X	X					1	DCE
G	IT	1	83	8	X	X	X					1	SM
H	IT	1	97	5	X							2	SM, DTA
I	Tele-communications	3	260	4	X					X		7	SPOC, SPOC, SPOC, PO, SPLC, TPAM, PM
J	IT	1	80	3	X							2	SDD, AD
K	IT	1	65	4	X							1	AC
L	IT	1	60	8	X	X	X	X		X		1	PMA
M	Financial	1	270	8	X					X		2	AOD, TM
N	Services	4	128	6	X							2	AL, EAM
O	IT	1	20	3	X							1	PTD
P	Pharmacist	1	15	6	X		X					1	SM
Q	IT	1	30	7	X		X			X		1	RTE
R	IT	3	70	7	X		X		X		X	1	AC
S	Financial	1	35	3	X		X	X				2	AC, APMO
T	Financial	11	400	6					X	X		1	AC
U	Tele-communications	3	85	6						X		3	PMA, PL, LC
V	Financial	2	10	4						X		1	AC

Roles: Center of Excellence Leader (CEL), Agile Coach (AC), Release Train Engineer (RTE), Head of Solutions Development (HSD), Senior Director Information Technology (SDIT), Senior Information Technology Manager (SITM), Lead Software Engineer (LSE), Marketing Portfolio Manager (MPM), Agility Consultant (AC), Project Manager (PM), Director Center Excellence (DCE), Scrum Master (SM), Digital Transformation Architect (DTA), Strategic Portfolio Coordinator (SPOC), Product Owner (PO), Strategic Planning Coordinator (SPLC), Transformation and People Analytics Manager (TPAM), Program Manager (PM), Software Development Director (SDD), Architecture Director (AD), Product Manager (PMA), Tech Manager (TM), Agile Office Director (AOD), Agility Leader (AL), Excellence and Agility Manager (EAM), Projects and Technology Director (PTD), Agile Project Management Office Manager (APMO), Project Leader (PL), Lean Consultant (LC).

Table II Case Projects Portfolios and descriptive variables

Regarding RQ1, the 59 portfolios of projects studied reveal the existence of a high level of variability in the contexts and experience of companies in the field of agility, and include projects in the areas of: IT, finance, merchandising, commercial and sales, business and innovation and product. Also, we observed that companies C, H, K, R have a set of independent projects focused on strategy, so it is a portfolio of projects (Cooper 1999) or a program of a cycle of business (Ferns, 1991), We were able to identify 60% of portfolios of projects of a strategic nature that make significant changes in the business, contribute to the organizational strategy and they focus on the future of companies, digital transformation, IT software, product, innovation and business (Figure 1). Although all the companies affirmed that their project portfolios are strategic, we identified 40% of project portfolios as leveraging the objectives of the strategic project portfolios, audit, internal control, and risks. "We define 30% for normative projects, 10% for tactical projects and the rest for projects of a strategic nature", says an Agile Project Management Office Manager (S). It is noteworthy that 85% of project portfolios of the companies studied have a high technological component, and despite the fact that there is a high concentration in the investments required by these portfolios, there is a deficit of human capital (e.g. “we have a number of 260 projects… [which] means that we are not taking into account it takes into account the existing base of staff resources and their capabilities”), says a Transformation and People Analytics Manager (I).

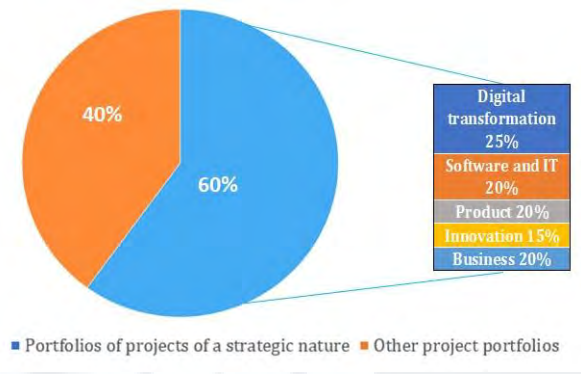


Figure 1. Characteristics of the project portfolio in practice

We also found that 100% of the companies have project portfolios with high work units over time, variability and frequent changes, and projects with shorter work units, more stable and with clearer needs. We observed that these companies tend to have low predictability in project portfolios due to unstable and turbulent environmental conditions. For example, five portfolios of projects of the companies C, F, G, P, S use a combination of the agile practices of Scrum and Kanban because they consider that these two methods guarantee a better performance in the projects according to their nature (e.g. “we use Kanban for services and operations, Scrum for projects and products, and we apply ScrumBan in other Lean-Agile projects, this has allowed us to use the strengths of each agile method for the dynamic nature of the projects”), reported an Agility Consultant (S).

Only 59% of the companies have a portfolio of projects (Table II). While companies A and T have 11 portfolios of projects that represent their business units; Company M has a single project portfolio that includes all the projects of the different business units, and Company I has three portfolios: strategic, innovation and product, and area. "We define the number of projects for each portfolio according to the needs of the company," says a Strategic Portfolio Coordinator (I). Although 100% of the cases the project portfolios are prioritized at the business unit level or from a committee made up of senior executives of the company that ensures an alignment between strategy and execution, we found that companies do not make optimal use of investments to minimize their risks. Indeed, "in the Portfolio Backlog there are 500 projects and in execution [only] we have 270", says an Agile Office Director (M). A Portfolio Backlog is an artifact that contains the projects approved and prioritized for implementation in the next businesses (Knaster & Leffingwell, 2020). Table III shows the characteristics of the project portfolios of the different companies These results indicate that 59% of the companies make up teams between six and 30, or between eight and 11 members for portfolios of projects in execution (e.g. “We use multiple organizational structures to attend to the quantity and volume of projects carried out in the Bank”), says an Agile Coach (T).

Company	# Portfolios	#Projects	# Teams	Characteristics
F, G, H, J, K, N	9	531	5 to 8	6 to 9 people per team
A, B, C, D, E, I, L, M, Q, R, T, U, V	47	1799	6 to 30	8 to 11 people per team.
O, P, S	3	70	3	4 to 7 people per team.

Table III Characteristics of the project portfolios

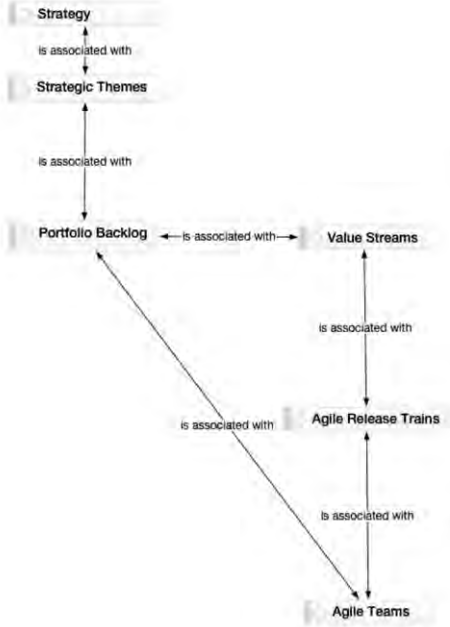
Regarding RQ2, we highlighted that 100% of the companies studied started the path to agility in an ascending way, implementing the Scrum framework from the team level. The company's Center of Excellence Leader statement (A) describes how it was accomplished: "While scaling was structured from the bottom up, if top management hadn't been engaged, we wouldn't have done it." 70% of companies develop strategic agility in a controlled way: leading by example, presenting satisfactory results with the implementation of agile methods, specifically Scrum, in short periods of time, and making it visible at the business level that projects work better with the agile methods of the APM approach. These companies have been using these results to propagate agile practices in other contexts such as PPM and have defined the steps to follow: grow, experiment and continue learning with the implementation of scalable agile frameworks, particularly SAFe, in PPM, to obtain results with greater impact on the business and the strategy (e.g. "We recommend that an agile transformation should start with a strategy of growth, experimentation and scaling in a controlled way to successfully progress in other directions of the organization"), says a Director Center Excellence (AND).

We highlight that 86% of companies use the Scrum framework and 60% use the business and strategy areas, with pilot projects that include a large IT component that drive agility and the Scrum method (Table II). However, while company H justifies the implementation of Scrum because it considers that it is the framework with the greatest use or application in companies; in company J they do not find that this framework offers them security and confidence because they consider that Scrum does not have a roadmap that demonstrates its effectiveness in an implementation; or in company U the agile transformation arose from an area -Marketing- using Scrum and Kanban, and later they implemented SAFe. On the other hand, although 54% of the companies use the SAFe framework (Table II); we found that these companies do not follow it specifically, and choose to implement hybrid schemes based on the APM frameworks, to integrate various agile practices that better adapt to their needs and evolution (e.g. “The reference is SAFe but it has been adapted and tropicalized with Scrum and Kanban to meet the needs of the company”), says a Release Train Engineer (A). We also found that the 11 portfolios of company T have a hybrid model for the organization of teams based on the Spotify Model and scaled with SAFe (e.g. “Spotify Model has allowed us a better organization of teams and SAFe a better governance scaling in the company”), says an Agile Coach (T). The company's Agile Coach (AC) statement (R) describes that: "SAFe is a rigid framework and the Spotify Model has better flexibility for companies." Finally, no project portfolio of companies A, B, C, D, E, I, L, M, Q, R, T, U, V explicitly implements scalable agile frameworks such as SAFe (Knaster & Leffingwell, 2020), Spotify Model (Kniberg & Ivarsson, 2012) or LeSS (Larman & Vodde 2017); furthermore, companies H, J, K, N, O explicitly follow the Scrum framework (Schwaber & Beedle, 2001) (Table II). Consequently, 77% of the surveyed companies use an agile practice hybrid model of APM methods and frameworks.

On the other hand, 59% of the companies studied have implemented a Center of Excellence (COE) (e.g. “the COE has allowed [us] to promote and evangelize agility, thanks to the Agile Coaches, the company has been adopting these with better receptivity changes", says a Senior Director Information Technology (B); "the commitment of the top management for the establishment of a COE in the organizational structure is fundamental because it requires advance investments"), affirms an Agile Office Director (M). We found that 100% of companies conclude that agility has increased the work in teams (e.g. "As agility brings results in short iterations, then the company wants more and more results and this has overwhelmed the capacity of the teams") says a Project Manager (I). We did not find a valid reason for implementing the SAFe framework in the surveyed companies. Indeed, the company's Center of Excellence Leader (A) stated that: "there is no valid reason, we did not do an in-depth study, I have known little about other frameworks, but I have been with SAFe for eight years and it seems the best to me." Consequently, we observed that in none of the companies studied there is an evaluation of the APM methods or frameworks to identify which or which are aligned to a specific business situation.

Project portfolio configuration in practice

From the 43 in-depth interviews and the visual process models created for each case, we grouped the action patterns that reappeared in the configuration of the project portfolio in practice, to respond to RQ1. After several iterations in which we collected additional information and consulted the literature, we identified in practice four groups of actors (senior management, project portfolio management, program management, project management), and we associated the activities in the following six practice domains (Figure 2).



Roles	Objective
Top and Senior Management (e.g. CEO, Board of Directors)	Strategic targeting.
Project Portfolio Management (e.g. MPM, CTO, VP)	Alignment between strategy and execution. Maximizing the value of the portfolio.
Program Management (e.g. RTE , PMA)	Multiple teams to deliver solutions.
Project Management (e.g. SM, PO)	Early deliveries based on value prioritization.

Figure 2. Project portfolio configuration in practice

- *Strategy:* Describes the future horizon established in companies, generally between one and three years, and defined by senior management (e.g. Holding (A), Board of Directors (J) or the Presidency and key Vice-presidencies (A, I).
- *Strategy Themes:* Refers to business objectives that make the connection between strategy and PPM. Although it is clear that companies define Key Performance Indicators (KPI), the novelty is in the use of Objectives and Key Results (OKR) that allow aligning strategy, tactics, and operations (S, T).
- *Portfolio Backlog:* It is the main domain because it contains all the projects that have been approved and prioritized by an evaluation committee for their implementation (A, B, C, D), based on their criticality, value contribution and alignment with the strategy (A, B, S).
- *Value Streams:* In this domain the scalability of agility is concentrated and contains the programs or solutions that companies wish to implement in cooperation and collaboration of multiple teams, this situation is evidenced in companies with implementation of scalable agile frameworks, such as SAFe (A, BI).
- *Agile Release Trains:* This domain specifies the multiple teams of agile teams that deliver an increment of the program (PI) in operation in 12 weeks, this usually occurs in six iterations (A, U, I), this situation is also evidenced in companies with implementation of scalable agile frameworks, such as SAFe (A, B, I).
- *Agile Teams:* This is the base domain of the project portfolio configuration in practice because it specifies the work from a set of multidisciplinary collaborators also defined Squads (A, B, I) or Scrum Team (O, P, S) that typically reiterates every two weeks to deliver an increment or set of Engaged User Stories (N, O). This situation is evidenced in companies with Scrum implementation (H, J, K, N, O).

Perceived challenges in practice and strategies

Regarding RQ3, Table IV shows the critical challenges that we identified and grouped into five categories, and the strategies to address them. The coded subjects were mentioned in the transcripts on 178 occasions; 33% were related to the organizational culture; 24% with resistance to change; 19% with strategic leadership; 15% with lack of knowledge and skills, and 9% with inconsistency of the processes.

Challenges	Findings	Strategies
Organizational cultural	Hierarchical, bureaucratic culture with a bias in agile values and principles. Fear of cultural transformation. Firmness in maintaining organizational silos. The role of middle leaders is unclear in the Lean-Agile transformation.	Experimentation with strategic pilot projects. Show satisfactory results in short iterations. Involve the organization in an evolutionary way. Encourage the leadership of leaders in the transformation.
Resistance to change	Little disposition of the collaborators.	Training and constant training.

	Fear of assuming new roles. General resistance to change. The descending structure creates resistance and little adaptation to change.	Repetitive accompaniment in the implementation of agility. Focus on people with leadership, coaching and mentoring workshops. Application of the model Kotter (Kotter, 2012).
Strategic leadership	Lack of advance investments. Little understanding of a previous preparation. Lack of training and coaching. Too many project portfolios. Little interest in a remote work environment. Lack of a governance model that encourages agility.	Investments in trainings and qualifications in Lean Change Management, Leadership 5.0, Lean-Agile Mindset, ontological and executive coaching. Inclusion in the organizational structure of the company of a Center of Excellence (COE) with high capacities (Knaster & Leffingwell, 2020).
Knowledge and skills shortage	Implementation of surface level agility. Need for constant education and training. Lack of orientation of the literature for implementing agility. Failures in the application of techniques and tools. High rotation. Unclear interpretations of scalable agile frameworks. Lack of dedicated teams.	Case-based learning. Adoption of prioritization techniques such as MoSCoW (Stapleton, 1997), Weighted Shortest Job First (WSJF) (Knaster & Leffingwell, 2020). Use of estimation practices such as Planning Poker (Cohn, 2006). Retention programs. People Analytics.
Process inconsistency	Disarticulation between the different areas. Inflexible and rigorous process structure. Lack of automation. Process misalignment. Obsolete processes. Cascade management.	Analysis and evaluation tools. Optimization of processes. Use of technological tools.

Table IV. Challenges and strategies reported in the cases

Perceived benefits in practice

Table V shows the benefits that we identified in the cases studied and grouped into four categories. Coded topics were mentioned in the transcripts 151 times; 29% were related to Time to Market, 29% to productivity, 17% to communication, 14% to adaptation to change, and 11% to continuous improvement. Also, we identified the main organizational aspects that companies consider when implementing scalable agile frameworks to respond to RQ4.

Benefits	Findings
Time-to-market	Strategic results, such as customer satisfaction, often increase with the use of agile practices. Faster time-to-market and Business value delivered have great benefits that are perceived in practice. Compliance with OKRs and KPIs are strengthened by minimizing process times and prioritizing value.
Productivity	Agile practices as recurring routines (e.g. Daily Standups, Retrospectives, System Demo, Program Increment (PI) Planning) often increase the productivity of multiple teams responsible for project portfolios. Alignment, cohesion, speed, and collaborative work lead organizations to have highly motivated teams generating a better work environment for companies.
Communication	Agility provides better communication on the true state of project portfolios. Better communication with transparency is perceived in practice at all organizational levels and with clients.
Adaptation to change	Participants noted that although there is resistance to change, scalable agile frameworks also favor organizations with better adaptation to change and agility towards global trends over time. In addition, it is perceived in practice that bureaucracy decreases and the benefits of a flat organization with a better distribution of work begin to emerge.

Table V. Benefits reported in the cases

Additionally, we identified the main organizational aspects manifested by the participants and that drive companies to implement scalable agile frameworks in PPM. We group them into six categories (Figure 3). Coded topics appeared 92 times in the transcripts; 41% were related to improving delivery times, 22% to achieving organizational agility, 18% to improving project management methods, 10% to a request from senior management, and 9% to incorporating changes in projects. The first three categories present the most relevant topics that motivate companies to implement scalable agile frameworks in PPM. We emphasize that companies are first inclined towards the Faster time-to-market option, which is why they go to implement agility in PPM, increasing satisfaction and improving the experience of their customers. Then, companies seek to achieve organizational agility; in this option, the scalable agile frameworks propose a complete transformation of the companies, which requires several years, and significant changes and major adaptations are made. Finally, companies seek to improve project management methods and go beyond the traditional PM approach, gradually replacing them with APM methods and frameworks. In this regard, a Scrum Master (G) stated that:

"agile practices such as Daily Standups and Retrospectives were incorporated into the few traditional projects that still remain in the company." The use of the five agile Scrum practices (Daily Standups, Retrospectives, Reviews, Planning, Backlog refinement) have improved communication and transparency in project portfolios (I, L, M).

Figure 3. Aspects of organizations reported in companies

Discussion

Our study explored the implementation of scalable agile frameworks in the project portfolio management (PPM) of large companies to understand how and when companies should approach an agile transformation process that works successfully in their PPM. We summarize the main findings and conclusions below. Indeed, our results show the existence of considerable similarities in all the cases studied regarding the variability of the project portfolios, that is, the project portfolios in companies are characterized by low predictability given that the environment in which they operate it is increasingly unstable and turbulent. Despite these general similarities with respect to the characteristics of the project portfolios, we distinguish four agile methods (Scrum, XP, Kanban and ScrumBan) and three scalable agile frameworks (SAFe, LeSS, Spofify Model) implemented in the PPM of companies (Table II). These seven methods and frameworks differ regarding the scope and coverage of needs for PPM, being used in a hybrid way in project portfolios. In the cases studied, the participants pointed out the challenges (Table IV) and the benefits (Table V) to consider in planning or in the middle of an agile transformation. This transformation requires key roles with specific objectives in the configuration of the project portfolio in practice that promote strategic agility in the company (Figure 2).

Our findings indicate that agile transformation usually starts from the bottom up specifically with Scrum and that initial results with individual teams are vital to propagate agile practices, 54% with SAFe, in much broader contexts until PPM is achieved. We also discovered that companies are making adaptations and integrations of agile methods and scalable agile frameworks in order to meet the needs and evolution of the business dynamics contained in the PPM. In this sense, our results corroborate the findings of Stettina and Horz (2015) because we confirm that the combination of various agile practices in PPM are common in companies; and those of Niederman et al., (2018) because the business practice of hybrid schemes ensure a better organizational integration of projects and programs in the PPM.

Additionally, we found that the main benefits that scalable agile frameworks bring to companies consist of the fast time-to-market of project portfolios and the increase in team productivity, which coincides with the findings of Russo (2021). We were surprised to verify that the implementation of scalable agile frameworks has been carried out without evaluation of strategy, growth, experimentation, and scaling, which generates very superficial adoptions in companies, and without considering an evaluation of criteria such as those proposed by Alqudah and Razali (2016), Dolman and Spearman (2017) and Dingsøyr et al. (2019). This finding causes companies to be unaware of the true strengths, weaknesses and opportunities in practice that scalable agile frameworks have for a specific business situation, as pointed out by Dingsøyr et al. (2019).

We found that scalable agile frameworks generate great interest in companies and expectation in their teams in several ways. First, we found portfolios of projects with strong components of research innovation, as suggested by Alqudah & Razali (2016), and a PPM driven by the changing dynamics of the environment. Second, we highlighted that the transparency in communication and agile practices (e.g. Daily Standups, Retrospectives and Reviews) developed by the teams generated an environment of collective responsibility and continuous progress, this result confirms the findings of Azanha et al., (2017). Third, we found that these agile practices are also essential to ensure better control of project portfolios and better synchronization of teams, which is consistent with the findings of Stettina & Heijstek (2011). Fourth, we found that the Product Owner and the Scrum Master are the two key roles in the Agile Teams domain (Figure 1). While the first drives agility in the team, the second prioritizes the creation of value for the business. This result confirms the findings of Schwaber

& Beedle (2001). However, we found that when those responsible for these roles take on additional responsibilities, project success is compromised. Fifth, we found that the agile practices of the Agile Release Trains domain (e.g. PI Planning, Scrum of Scrum and System Demo) are difficult to implement in their initial stages because they involve different organizational levels of the company, as demonstrated by Stettina & Horz (2015). Finally, we found that in practice our results are not in line with the recommendations of previous research which suggest dedicated self-managed and self-organized teams (Cervone, 2011; Chin, 2004; Highsmith, 2004), since in 79% of the cases studied, teams are not fully dedicated to project portfolios.

Although it is true that we found that the PPM of companies concentrates large investments in various project portfolios, we suggest carrying out a continuous prioritization process based on their criticality, value generation and alignment with the strategy to have a centralized and optimized portfolio (Knaster & Leffingwell, 2020). We found that, although the PPM represents the investment strategy of companies (Dye & Pennypacker, 1999); however, the companies studied use unclear mechanisms for prioritizing and selecting investments, which generates several portfolios with multiple projects, including a finite capacity for human capital. Consequently, our findings show a different trend from that indicated by previous research that highlights the importance, not only of identifying which projects meet the criteria established at a strategic level to be included in the portfolio (Jonas et al., 2013); rather, when a company has several portfolios of projects, this can lead to an untransparent allocation of resources (Krebs, 2008; PMI, 2017).

Finally, in line with previous research (e.g. Dikert et al., 2016; Dingsøyr et al., 2019; Conboy & Carroll, 2019; Marinho et al., 2021; Paasivaara et al., 2018; Rufo-McCarron, 2018) we demonstrated that agile methods and scalable agile frameworks are a viable option for faster time-to-market, increasing team productivity, improving communication at a general level, and favoring adaptation to change in companies. We also verified that the support of the top management for the constant learning of the employees makes the difference in terms of the results of agility and the positive transformation of the companies. Also, we highlighted the importance of an agile governance structure to create favorable conditions for three backgrounds: employee learning and knowledge, the use of APM methods and frameworks in their daily work, and the mitigation of susceptible challenges in planning or during an agile transformation to anticipate them in practice. Indeed, a governance structure open to agility can create an environment of constant training, education, and evangelization at the different organizational levels conducive to a successful agile transformation.

Conclusion and practical and theoretical implications

The few investigations on scalable agile frameworks in the PPM of large companies (Dikert et al., 2016; Dingsøyr et al., 2019; Conboy & Carroll, 2019; Paasivaara et al., 2018), focus mainly on studying agile methods in projects with individual teams (Azanha et al., 2017; Kettunen & Laanti, 2008). Agile transformation is difficult for companies (Dikert et al., 2016), because it consists of iterative stages that require financial investment and time for the organizational culture to focus on change and adaptation; and the literature offers few recommendations on how to deal with this process successfully. Therefore, the qualitative approach and the research strategy of the case study are an important tool to explore in practice, the reality of scalable agile frameworks in the PPM of large companies and for the construction of theory.

Our study explored the implementation of scalable agile frameworks in the PPM of large companies, by identifying 59 project portfolios in 22 Latin American companies; and consequently, we highlighted two contributions to the theory. First, our study is one of the first to explore how large enterprises implement scalable agile frameworks in PPM. Second, we filled the gap in the literature related to how an agile transformation is carried out considering five challenges, four benefits and five organizational aspects: as well as the characterization and configuration of the project portfolio in practice.

In relation to management, our results highlight the need for top management and the organizational structure to promote a broader orientation of scalable agile frameworks in PPM, specifically, better knowledge and development of skills related to the implementation of these frameworks to lead and organize a successful agile transformation in the company. In this sense, we highlight six key aspects to consider in the implementation of scalable agile frameworks in the PPM practice of large companies:

- *Hybrid models:* To successfully support the variability of project portfolios that a company concentrates, it is necessary to have a deep understanding and evaluation of agile methods (Scrum, Kanban, XP) and scalable agile frameworks (SAFe, Spotify Model, LESS), to establish hybrid schemes that consolidate the best performing agile practices.
- *Prioritization of the project portfolio:* Due to the large investments required to meet the strategic objectives and established in projects, it is necessary to centralize the strategic projects in a single portfolio that is the focus of the entire organizational strategy.
- *Agile practices:* Recurring routines (e.g. Daily Standups, Retrospectives, and Reviews) in the Agile Teams domain are the basis for stimulating the need for frequent ceremonies (eg PI Planning, Scrum of Scrum, and System Demo) in the *Agile Release Trains* domain.

- *People:* to achieve closer results in an agile transformation, it is necessary that there be a focus on people's well-being, as well as constant training, and support to mitigate challenges.
- *Advance investments:* for agility to work, it is necessary to make advance investments in physical and technological infrastructure adjustments, in-depth training and education programs for people, organizational reorganization programs with new job titles and functions.
- *Transition:* to achieve complete agility in the company, it is necessary to start with pilot strategic projects, which become benchmarks to spread their results in large-scale projects and contexts.

Our study is useful for companies that are starting or are in an agile transformation process with implementations of agile methods and scalable agile frameworks because it provides managers with advance information to face the challenges of an agile transformation. We conclude that the road to agility is long and with many obstacles, since it is a process of learning and continuous improvement as a resistance of companies to successfully overcome five challenges: the organizational culture, the resistance to change, the strategic leadership, the lack of knowledge and skills, and the inconsistency of the processes. This process is difficult for traditional companies less willing to change and adapt, and represents a significant transformation of people, processes, systems, and technology over time.

Limitations and recommendations for research

The use of self-report data (interviews) implies potential limitations regarding the validity of the concept and the internal validity of the results (Pentland & Feldman, 2007). To address this limitation, we have used, as described above, a triangulation procedure based on data from different sources (semi-structured in-depth interviews, field notes, and important supporting documents for the interviews). As Yin (2018) argues, the purpose of multiple case studies lies in the possibility of making analytical or theoretical generalizations instead of statistical generalizations, that is, in identifying and replicating theoretically significant situations through several cases. We affirm that our findings and conclusions in the present study meet this methodological requirement by being based on observed patterns and in part contrasted through a set of 59 cases, as well as supported by theory and previous research.

Considering the exploratory scope of this study and its importance for the academy and the business sector, the number of cases analyzed guarantees a potential basis for future research and publications. We suggest conducting further studies that confirm our findings and show the practical results of scalable agile frameworks in the agile culture of large companies; and to confirm if PPM is more successful or not with the implementation of these agile frameworks. We also recommend doing more research on agile transformations, given the scarcity of research in this area of knowledge; on how to implement an agile governance structure in companies; and to confirm whether organizational agility is more successful with the implementation of this structure, and to explore the implementation of Value Streams and Agile Release Trains in companies.

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Chapter II. Conclusions and Recommendations

Conclusions

The present study contributes to the PPM approach and its literature, at the same time as to the PM theory, considering that it is a more strategic and higher-level function than PM so that PPM becomes a contribution to PM in uncertain environments (Conforto et al., 2016; Chin, 2004), although both are interdependent (Brady & Davies, 2004; Keegan & Turner, 2002; Larson, 2004). A few pieces of research on scalable agile frameworks in the PPM of large companies (Dikert et al., 2016; Dingsøyr et al., 2019; Conboy & Carroll, 2019; Paasivaara et al., 2018) mainly focus on studying agile methods in projects with individual teams (Azanha et al., 2017; Kettunen & Laanti, 2008). Positioned in an emerging state, there is empirical evidence related to the implementation of these frameworks, their effectiveness, and challenges within multiple projects with different organizational structures in large companies (Beecham et al., 2021; Dingsøyr et al., 2019; Conboy & Carroll, 2019; Hobbs & Petit, 2017; Marinho et al., 2021; Sweetman & Conboy, 2018). Therefore, the purpose of this research implies to explore the implementation of scalable agile frameworks in the PPM of these companies.

Recent studies recommend developing case studies on the implementation of scalable agile frameworks in PPM (Beecham et al., 2021; Conboy & Carroll, 2019; Dingsøyr et al., 2019), due to the relevance of these frameworks in enterprises (Digital.ai., 2021; Dikert et al., 2016; Paasivaara et al., 2018). This paucity of research turns into a disorientation on when and how companies should approach an agile transformation process that works successfully in their PPM. Consequently, the first contribution to the theory is the exploration of how large companies that implement scalable agile frameworks in PPM achieve significant economic results in a reasonable timeframe. This contribution is reflected in a conceptual framework with deep explanations and meanings in the 59 project portfolios and 22 companies studied.

This framework adds knowledge when describing the potential characteristics of project portfolios managed with scalable agile frameworks and an overview of project portfolio configuration in practice. Additionally, it explains why companies should implement scalable agile frameworks, why they are implemented in PPM, how companies initiate an agile transformation, and who is responsible for this process.

APM describes scalable agile frameworks designed for large enterprises with multiple organizational structures that include many stakeholders (Dikert et al., 2016; Dingsøyr et al., 2019) corresponding to their large size. These stakeholders tend to be geographically distributed through performing activities within an organizational integration of various projects and programs in PPM (Ambler, 2008; Niederman et al., 2018). In addition, scalable agile frameworks emerged from the need of large companies to achieve an agile transformation (Paasivaara et al., 2018; Beecham et al., 2020) that promotes cultural alterations in management processes and technological tools to reach organizational agility (Highsmith, 2004, 2010; Sharifi & Zhang, 2001). Therefore, the second contribution to the theory of this study is to fill the gap in the literature referring to how an agile transformation is realized by explaining five challenges about the implementation of scalable agile frameworks in PPM and their prospective strategies to remedy the identified challenges. Also, highlight four benefits and five organizational aspects that drive companies to implement scalable agile frameworks in PPM.

This research shows that in large companies there are several project portfolios with high variability in service, product and innovation. This study reveals that companies face the following challenges in implementing scalable agile frameworks in PPM, organizational culture, resistance to change, strategic leadership, shortage of knowledge and skills, and inconsistency of procedures. Furthermore, these findings are aligned with previous research (e.g., Dikert et al., 2016; Dingsøyr et al., 2019; Conboy & Carroll, 2019; Marinho et al., 2021;

Paasivaara et al., 2018; Patanakul & Rufo-McCarron, 2018) stating as key challenges in the agile transformation of large companies the lack of investment and coordination of multiple teams (Patanakul & Rufo-McCarron, 2018; Paasivaara et al., 2018), and the need to build and maintain a shared understanding of customer value with a shortfall in supporting change (Dingsøyr et al., 2019; Kasauli et al., 2021).

Regarding the benefits perceived in practice with the implementation of scalable agile frameworks in PPM, this study emphasizes that these frameworks are a viable option to reduce time-to-market, increase team productivity and communication at a general level, and boost adaptation to change. Reducing time-to-market, achieving organizational agility and improving project management methods are the main organizational aspects, which is why companies turn to implement scalable agile frameworks in PPM. These results support recent studies (e.g., Conboy & Carroll, 2019; Digital.ai., 2021; Jorgensen, 2019; Marinho et al., 2021), that reported that faster time-to-market, increasing revenue growth, lower costs and attraction of more competitive staff are important enablers to generate interest in implementing scalable agile frameworks in the PPM.

Previous studies on the implementation of agile methods at the individual and team/project levels demonstrate success factors and offer suitable recommendations (Conboy & Carroll, 2019). However, recent research suggests more in-depth empirical evidence on scalable agile frameworks in large companies' environments (Beecham et al., 2021; Marinho et al., 2021). Therefore, the third contribution of this study to theory is to provide in-depth empirical evidence from six Latin American countries on the implementation of scalable agile frameworks in PPM. This empirical evidence delivers new insights and relevant recommendations on the use or application of scalable agile frameworks in the practice of large multi-team companies in Latin America, and those that share the same characteristics. It incites the adaptation of these frameworks to such contexts, achieving a better interaction

between agile practices and agile roles, and implementing hybrid schemes or models derived from the unification of several scalable agile frameworks in global software projects to ensure better results and reduce failure factors.

Recent studies have added that companies rely on scalable agile frameworks to improve the communication, coordination, and productivity of agile teams (Marinho et al., 2021). These multifunctional, self-organized and highly skilled teams are responsible for the success of projects and the roles of the traditional project manager (Gandomani et al., 2020). Product Owners in these multifunctional teams have become the focus of agile practices developed in release planning because they represent the essential needs of customers (Kantola et al., 2022). This role seeks the realization of business benefits through frequent deliveries to their customers with continuous feedback loops (Amorima et al., 2020), which results in higher success rates in software project portfolios (Marnewick et. al., 2022).

It is recommended to significantly enhance the quality of software projects to improve the punctuality of frequent deliveries (Alami & Krancher, 2022; Saarikallio & Tyrväinen, 2022). This quality is achieved through proper refinement of requirements, good agile team stability and excellent management of interdependencies among multiple teams (Kula & Deursen, 2022). To ensure better transparency in large enterprises regarding project portfolios, teams should share release planning to know which teams have excessive work planned to transfer or get support from other teams (Gustavsson et al., 2022). The SAFe framework is positioned as a benchmark tool in large enterprises for global software projects when achieving better levels of coordination in project portfolios (Marinho et al., 2021), which in turn generate complexity and rigidity (Kowalczyk et al., 2022).

Implications

This study explored the implementation of scalable agile frameworks in the PPM of large companies through the identification of 59 project portfolios in 22 Latin American

companies. The analytical generalizations allowed identifying and verifying theoretically significant patterns applied only in this type of company, not in SMEs. This research suggests the need for management development on company leaders promoting better guidance and orientation to scalable agile frameworks in PPM. This orientation is performed through experimentation strategies with strategic pilot projects, coaching and constant training, the inclusion of an agile governance structure - COE - with high capabilities (Knaster & Leffingwell, 2019), case-based learning, and the application of Kotter's model (Kotter, 2012), which provides better knowledge and skills to lead and organize a successful agile transformation.

As such, this research highlights six key aspects to consider in the implementation of scalable agile frameworks in the PPM practice of large enterprises:

- **Hybrid models:** Considering that the trend in large companies is to manage project portfolios with high variability, it is necessary to have a deep understanding and evaluation of agile methods such as Scrum (Schwaber & Beedle, 2001), Kanban (Anderson, 2010), XP (Beck, 1999) and scalable agile frameworks as SAFe (Knaster & Leffingwell, 2019), Spotify Model (Kniberg & Ivarsson, 2012), LESS (Larman & Vodde 2017). These are the most widely adopted in companies and recommended to establish hybrid schemes or models that consolidate their agile practices with better performance to make adaptations in compliance with the needs of companies.
- **Prioritization of the project portfolio:** Due to the large investments required to meet strategic and stated project objectives, it is necessary to centralize strategic projects into a single portfolio as the focus of the entire organizational strategy based on a rigorous process of prioritization and selection of investments based on their criticality, value generation and alignment with strategy (Knaster & Leffingwell, 2019).

- **Agile practices:** The implementation of agile frameworks must start with the application of frequent routines (e.g., Daily Standups, Retrospectives and Reviews) in the Agile Teams domain, being the basis to stimulate the need for frequent ceremonies (e.g., PI Planning, Scrum of Scrum and System Demo) in the Agile Release Trains domain, so that Agility can be propagated or extended in a controlled manner in the enterprises.
- **People:** People are the center of the agile transformation. Then, it is necessary to focus on the well-being of people at the organizational level to achieve satisfactory results in the short term. Besides, to provide training, coaching and constant support to quickly mitigate the challenges that arise in the implementation of agile frameworks in PPM.
- **Advance investments:** Agility seeks changes and major transformations that require early capital investments in physical and technological infrastructure adjustments, training programs and in-depth training of people, and organizational reorganization programs with new job titles and functions.
- **Transition:** The implementation of scalable agile frameworks must be done in a structured manner. Starting experimentation with pilot projects applying agile methods such as Scrum (Schwaber & Beedle, 2001), Kanban (Anderson, 2010) or XP (Beck, 1999) becomes the best experience and reference to propagate, expand, scale and jump to the implementation of scalable agile frameworks in large-scale contexts according to the needs of the company.

Recommendations

Considering the exploratory scope of this study and its importance for academia and the business sector, the number of cases analyzed warrants a potential basis for future research. Therefore, the findings of this novel study on the implementation of scalable agile frameworks in PPM create the opportunity for other researchers to pursue this line of inquiry due to its

importance within companies. This inquiry has a promising future and requires attention to develop practice-based research that explores the functional and day-to-day environment of scalable agile frameworks in PPM. This environment is increasingly complex, dynamic, and interconnected, which involves strategic conceptual aspects being implemented (Clegg et al., 2018).

Further research is suggested to confirm the findings of this study to show the practical results of implementing scalable agile frameworks in the agile culture of large companies. It is also recommended to conduct further research on agile transformations due to the scarcity of research in this area of knowledge to (a) implement an agile governance structure in enterprises; (b) confirm whether organizational agility is more successful or not with the implementation of this structure, and (c) explore the implementation of Value Streams and Agile Release Trains in enterprises.

Recent studies point out that there is a need to study the quality of software projects with agile implementation, considering that current research provides little information on the additional value of agile methods and scalable agile frameworks on software quality (Alami & Krancher, 2022). Additionally, research needs to be conducted to provide conceptual frameworks on how an agile organization can further enhance its performance and what promoting quality aspects imply (Saarikallio & Tyrväinen, 2022). These gaps in the recent literature indicate that there is an interest in studying agile methods and scalable agile frameworks due to the relevance of this phenomenon for academia and practice. Major researchers should enhance this line of inquiry by exploring in practice the day-to-day aspect of software development projects with the use and application of agile frameworks to demonstrate projects improve their quality. As a final point, it is recommended to inquire into the challenges in scaling agility in the context of global software projects (Marinho et al., 2021) and explore the artifacts of the SAFe framework in large enterprises (Kowalczyk et al., 2022).

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Appendix A: Acceptance Letter of the Research Article

Elsevier B.V. Radarweg 29
1043 NX Amsterdam
Netherlands Customer Support Center

To: Elkin Doney Suárez-Gómez

CENTRUM Católica Graduate Business School, Lima, Perú

Dears Authors: *Elkin Doney Suárez-Gómez and Carlos Arturo Hoyos-Vallejo.*

05/10/2022

Reference: TRIP-1091-B

Acceptance Letter

We would like to inform you that your paper titled "*Scalable Agile Frameworks in Large Enterprise Project Portfolio Management*" has been accepted for publication in **European Research on Management and Business Economics ISSN 24448834**, current issue of 2022 based on the Recommendation of the Editorial Board after previous corrections made by the authors.

Link: https://www.journals.elsevier.com/european-research-on-management-and-business-economics

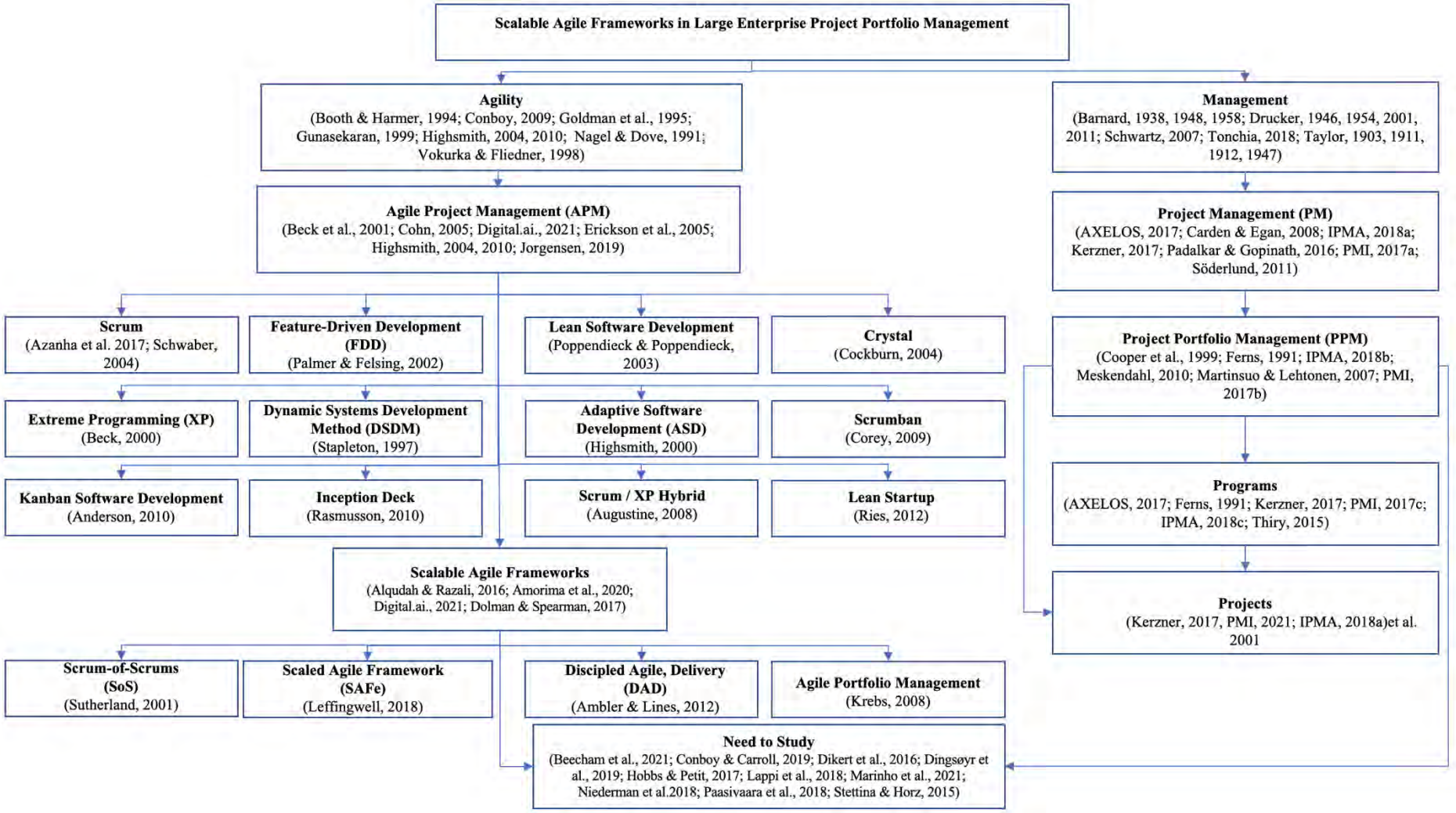
This letter is the official confirmation of acceptance of your research paper. Your research paper will be appearing in the **Volume 29 issue 1 (2022)** of European Research on Management and Business Economics. Kindly acknowledge the Paper acceptance.

Thank you.

Yours Sincerely,

Tony Crespo Franco.
Editor-in-Chief
University of Vigo, Spain

Appendix B: Literature Map



Appendix C: Semi-structured Interview Guide

Part I. Demographic information and general questions of Project Portfolio Management (PPM)

Identify the company's project portfolio (s) and the highest-level manager of PPM's responsibility and governance. In addition, the relationship of PPM with strategic objectives and the existence of scalable agile frameworks or agile methods in the organization.

Code	Required information	Question
Q1	Company name	What is the name of the company?
Q2	Name of the employee	What her name?
Q3	Position in the organization	What is your position within the company?
Q4	Economic sector	What is the sector of your organization?
Q5	Existence of a PPM	How is strategy connected to execution?
Q6	Definition form of communication.	How is project portfolio management (PPM) defined and communicated?
Q7	Alignment between PPM and strategy.	Do your vision and strategic objectives align the project portfolio management with the company's strategy?
Q8	Application and use of agile frameworks	What scalable agile frameworks or agile methods are implemented in the organization?
Q9	Reasons to apply or use scalable agile frameworks or agile methods.	Why have you implemented scalable agile frameworks or agile methods? (a) request from senior management, (b) improve project management methods, (c) incorporate changes in projects, (d) improve delivery times, (e) achieve business agility, (d) other and specify.
Q10	Responsible for an agile transformation.	Who are responsible for organizational agility? Why?
Q11	Background of agility in the company.	Why do you start agile transformation in the company?

Part II. Strategic Project Portfolio Management (PPM)

Explore portfolio lifecycle, strategic management, and capacity management and identify agile tools and techniques used.

Code	Required information	Question
Q12	Number of project portfolio.	How many project portfolios does the company have?
Q13	Types of projects in the portfolio (s).	What types of projects make up the project portfolio (s)? Why?

Q14	Number of projects.	How is the number of projects defined in the portfolio (s)?
Q15	Existence of a display and administration dashboard	What tool is used to visualize and manage epics or strategic objectives? (For example: *Kanban,* Balanced Scorecard -BSC) Why?
Q16	Business case type	Why is your organization using traditional or *lean* business cases?
Q17	Origin and approval of the business case	Who generates the business cases and who approves them? Why?
Q18	Prioritization and selection process	How are project portfolios prioritized and selected?
Q19	Project portfolio approval	Who or who are responsible for the approval of project portfolios? Why?
P20	Project portfolio organization type	Why are work breakdown structures or value chains used in the organization of project portfolios?
Q21	Portfolio capacity management	How is the allocation, administration and balancing of resources carried out?
Q22	Management of interdependencies	How do you manage the interdependencies between the different project portfolios?

Part III. Project Portfolio Governance

Explore the roles and responsibilities of the project portfolio, decision making, inspection, adaptation and integration into the agile culture of the organization.

Code	Required information	Question
Q23	Roles and responsibilities of the project portfolio	What roles and responsibilities were defined for the project portfolio (s)? Why?
Q24	Planning and estimation process	What agile practices are applied in planning and estimating the project portfolio? (ex: *Lean Budget Guardrails* , increments, iterations, story points, *planning poker*) Why?
Q25	Inspection and adaptation process	What agile practices are applied in the inspection and adaptation of the project portfolio? (eg Business Synchronization (PO-Sync), *Scrum of Scrums* , Backlog Refinement, Retrospectives, Reviews) Why?
Q26	Benefits of applying or using agile practices	What are the benefits of implementing these agile practices? Why?
Q27	Strategies to face the challenges	What strategies have been implemented to face the challenges? Why?
Q28	New normal of the COVID-19 pandemic	How was the transition process to a remote work environment?

Part IV. Portfolio Value Management

Identify and predict the expected performance of the project portfolio as defined by the organizational strategy, and transparency and commitment to stakeholders.

Code	Required information	Question
Q29	Predictive indicators of the project portfolio	What predictor indicators does the project portfolio (s) use to predict outcomes? Why?
P30	Fact-based measures to evaluate performance	What are the Key Performance Indicators (KPIs) that are used to assess performance on the project portfolio (s)? Why?
Q31	Interpretation of the indicator results	How are the results of the project portfolio indicators interpreted as defined by the organizational strategy?
Q32	Periodicity of information and evaluation of results	How often are the results reported and evaluated?
Q33	Review and update of the project portfolio	How is the project portfolio (s) reviewed and updated?
Q34	Monitoring automation	How is the collection of information for the results of the indicators carried out?

Part V. Closing Questions

It allows getting additional information and generating a snowball sampling through referrals to expand the information of the current case or referrals to include in the sample.

Code	Required information	Question
Q35	Satisfaction with the current PPM process	Are you satisfied with the current project portfolio management process? Why?
Q36	Continuous improvement	What lessons learned have been converted into actions to be implemented in future project portfolios? Why?
Q37	Topics to consider for the study	What important topic was not covered during the interview? Anything else you want to add?
Q38	Instrument scope	How did you feel about the issues that were addressed in the interview?
Q39	To amplify information	What other manager within the organization could expand on the questions related to portfolio value management? (name, position, contact information)
P40	Case recommendation	Which manager has a high level of responsibility and governance in another portfolio? (name, position, contact information).