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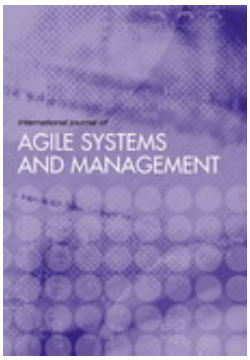

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Relevance of scaled agile practices to agile portfolio management

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Abstract: This research seeks to establish the relevance of scaled agile practices to agile portfolio management (APM) in ensuring the implementation of organisational strategy in a dynamic and complex environment. The study takes a descriptive approach that uses a narrative review to provide a conceptual framework for portfolio management as well as qualitative document analysis to assess the extent to which scaled agile practices bear relevance to APM. While providing unambiguous and specific activities for the successfully management of agile portfolio, without getting lost in unnecessary details and duplications, and being carried by the flow of a specific framework, the results indicate limitations of scaling agile frameworks. The implication for this study is that organisations using scaling agile frameworks to account for portfolio management, might not succeed in implementing organisational strategy and should review their practices to opt for a more comprehensive approach to the management of a portfolio of agile initiatives.

Keywords: agile methods; scaled agile practices; agile portfolio management; dynamic and complex environment; strategy formulation and implementation.

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Biographical notes: Kwete Mwana Nyandongo is an academic at the University of Johannesburg's Department of Applied Information Systems and a seasoned professional consultant. With a PhD in IT Management and over 15 years of experience, he provides smart and innovative solutions, leveraging expertise in IT management, governance, auditing, project management, solution architecture, and software development. A trainer and reviewer for academic journals and conferences, he has contributed to the ISO 3PM governance standard and has empowered over 650 project managers. He enhances organisational effectiveness through cutting-edge IT solutions, advancing IT management research and practice. His expertise seamlessly drives real-world impact in IT, organisational strategy, and competitive advantage.

1 Introduction

Organisations are using portfolio management, at least in its predictive approach, to implement their strategies and achieve a competitive advantage (Nyandongo and Mshweshwe, 2017). However, the advent of the iterative approach (agile) to project management created the need to develop an appropriate and similar approach for the management of a portfolio of agile initiatives (Nyandongo, 2022).

Agile portfolio management (APM) is considered as a new practice that is still in its early stages (Laanti et al., 2015), with very little research undertaken (Stettina and Schoemaker, 2018, Sweetman and Conboy, 2013). Unlike the predictive approach, which is well established with sound practices that can be applied across the board, accommodating projects of any size and complexity (Stettina and Hörz, 2015), agile methods that have given rise to APM were developed for small, collocated and stand-alone teams (Putta et al., 2019; Bass, 2019; Putta, 2018).

Nevertheless, portfolio management has remained challenging even in its well-established format of the predictive approach (Stettina and Hörz, 2015) and even when it is used by the best of organisations (Rautiainen et al., 2011). As Stettina et al. (2018) put it, acquiring portfolio management capability remains challenging whether it is iterative (agile) or predictive. Horlach et al. (2018) demonstrate how challenging it is for an organisation to find a fitting approach for portfolio management.

In the particular context of an IT portfolio where the IT components in the portfolio are recognised to be different from components in other portfolios in terms of complexity and degree of change faced (Sweetman and Conboy, 2019), Hoffmann et al. (2020) note that "organisations struggle to effectively manage and balance complex portfolio of IT projects". Sweetman and Conboy (2019) state that unlike in other disciplines, the number of teams involved and interdependencies among IT components in an IT portfolio, the ambiguity of goals pursued, the ever-changing business and technological environment, the irreversibility of many information technology/information systems investments and the difficulty to track the value of these investments makes IT portfolio management more challenging.

Jerbrant and Gustavsson (2013) found that no existing standards and formal portfolio management methods or models are capable of enabling effective portfolio management in turbulent, dynamic and complex environments. PMI (2015) states that within such a changing and competitive environment that requires organisations to be agile, the need for portfolio management is critical. Cooper and Sommer (2020) add that with the advent of the agile way of managing projects, companies need to reassess how their portfolios should be managed, decisions on prioritisation made and performance measured.

This paper is seeking answers to the following two questions:

1 How should portfolio management be approached within organisations, irrespective of the development approach?

2 What current scaling agile practices are relevant to the management of a portfolio of agile initiatives?

2 Related works

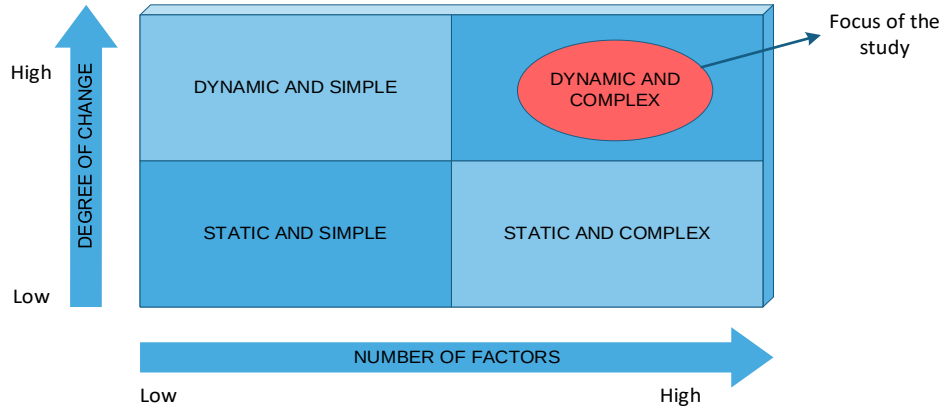
2.1 The agile approach

According to Dingsøyr and Moe (2014), the core difference between APM and predictive portfolio management resides in the management approach of projects within these portfolios. The agile approach to project management has been envisaged to address the deficiencies of the predictive approach to project management (Bastarrica et al., 2018; Liubchenko, 2016; Almeida and Carneiro, 2021). This move resulted from the realisation that projects that fit the characteristics of the predictive approach to project management were becoming rare (Ahimbisibwe et al., 2017; Chuang et al., 2014), and the environment in which organisations were operating was becoming more complex, dynamic and fast changing, with a high level of uncertainty (Serrador and Pinto, 2015; Liubchenko, 2016).

Duncan (1972) identifies two dimensions of the environment, which are simple or complex, and static or dynamic. The first dimension, simple-complex, deals with the number of factors considered in the decision-making process, the environment being simple when the number is minimal and factors are similar, and complex when dealing with a large number of factors in the decision-making process (Downey and Slocum, 1975; Boyd and Fulk, 1996). The second dimension, static-dynamic, deals with the variation of environmental factors, with the environment considered static when factors do not change within the decision-making process, and dynamic when factors taken into consideration in the decision-making process change over time (Downey and Slocum, 1975; Boyd and Fulk, 1996).

Figure 1 captures the environmental dimensions by depicting on one side the extent of change and on the other side the number of factors that have implications for the organisation.

Figure 1 Characteristics of the organisational environment (see online version for colours)



As illustrated in Figure 1, the extremes of both dimensions, i.e., dynamic and complex, constitute the focus of this research. According to Boyd and Fulk (1996), such complexity and dynamism in the business environment result in changes and unpredictability that lead to the greatest uncertainties. Cervone (2014) states that those taking part in strategy formulation and execution processes should constantly analyse the organisational environment to identify and understand the threats and opportunities faced

by the organisation. Organisations that succeed in today's organisational environment do not just pre-empt the consequence of uncertainties, but they remain perceptive to take the opportunity that may arise from the positive aspect of the uncertainty (Dönmez and Grote, 2018).

Organisations are confronted with the need to shorten delivery cycles, provide flexibility and adaptability to their initiatives (Ahimbisibwe et al., 2017), cut costs and respond to the increased pressure on innovation (Spalek, 2016). They understood that they needed more responsive and flexible methodologies to address the increased competition faced (Kassab et al., 2018), methodologies that not only responded quickly to change, but also left room for creativity (Liubchenko, 2016) and facilitated deviation (Serrador and Pinto, 2015; Khalil and Khalil, 2023).

The agile approach uses both interactive and incremental processes (Bishop et al., 2018; Henriksen and Pedersen, 2017) to continuously design, improve, test and integrate a software solution based on changes and feedback, in a highly collaborate way with customers or end-users (Dingsøyr et al., 2018a; Flora and Chande, 2014). The approach is considered incremental as the scope of the project is subdivided into small batches of the same size, and iterative because each batch goes into a round of the same duration, referred to as an iteration or loop, resulting in an increment to the product (Al-Zewairi et al., 2017; Henriksen and Pedersen, 2017; Kannan et al., 2014).

Key characteristics of the agile approach include frequent and continuous deliveries or releases, short development cycles, continuous improvement, constant collaboration, speed, and adaptation to change and value driven (Bishop et al., 2018; Flora and Chande, 2014; Drury-Grogan et al., 2017; Nyandongo and Madumo, 2022; Wangsa et al., 2022).

Agility is fundamental to the agile approach and it is described as the "ability to take some actions based on external stimuli" (Tallon et al., 2019), or more specifically, the capacity to respond quickly in an uncertain and continuously changing environment (Xu and Koivumäki, 2019; Salameh, 2014). Agility is encapsulated in the four agile core values that should be conformed to and twelve principles that frame any agile practice (Beck et al., 2001), thus making agile methods more principles based than rule based.

Over the years, numerous agile methods have been created by mostly practitioners (Dybå and Dingsøyr, 2008), each with a different set of practices that should be considered for developing software (Henriksen and Pedersen, 2017).

2.2 Scaling agile methods

Researchers and practitioners acknowledge that agile has achieved success in small and collocated team environments (Dikert et al., 2016; Jovanović et al., 2017). These environments are described as the 'sweet spot' where agile has thrived in improving efficiency and effectiveness (Rautiainen et al., 2011; Stettina and Hörz, 2015; Šmite et al., 2019). It is as a result of these successes that researchers and practitioners have felt the need to fill the gap at portfolio level, by scaling up agile practices to larger and distributed teams (Putta et al., 2019) so as to cope with the increasing change in the business environment and improve delivery organisation-wide (Barroca et al., 2019).

Agile practices are considered as large-scale development based on the number of teams involved, the number of systems to be developed and their interdependencies (Dingsøyr et al., 2018a; Dikert et al., 2016; Dingsøyr and Moe, 2014). They are sometimes subcategorised as large scale when the number of teams involved is between

two and nine, and very large scale when the number of teams involved is 10 or above (Berntzen et al., 2019; Dingsøyr et al., 2018a).

Practitioners have developed several scaled agile frameworks (SAFe) (Theobald et al., 2019; Putta et al., 2019; Gustavsson, 2023) in order to implement agile at scale (Bjørnson et al., 2018). Based on a review by Alqudah and Razali (2016) of agile scaling methods, the work of Ebert and Paasivaara (2017) on scaling agile and the reviews of Kalenda et al. (2018) of scaling practices, Table 1 is a summary of the most popular and influential scaling agile frameworks.

Table 1 Scaled agile frameworks

Framework	*Purpose*	*Scope*	*Target audience*	*Issuing author*
Scaled agile framework (SAFe)	Provides a knowledge base of proven and integrated principles, practices, artefacts, and competencies for achieving business agility	Software with 50 to 120 people	Large and traditional lean enterprises	Leffingwell (2019)
Scrum@Scale/ Scrum of Scrums (SoS)	To efficiently coordinate teams in a way that optimises the overall strategy of the organisation, by extending across the organisation the way a single scrum team function	Software, hardware, and systems; flexible with 5 to 10 teams	All types of organisations	Sutherland (2019a)
Large-scale scrum (Less)	Scales scrum principles, purpose, elements, and elegance so as to apply it in a larger scale context	Software with up to 10 teams of 7 members each	Large enterprises	Larman and Vodde (2016)
Disciplined agile delivery (DAD)	Provides a learning-oriented agile approach to developing IT solutions that mix multiple agile methods and include extra practices to adapt and scale agile to enterprise level	Software with 200 people or more	Multiple organisations and enterprises	Ambler and Lines (2019)
Nexus	Scales up scrum practice into a framework that can be used to develop scaled-up products and software initiatives while dealing with dependencies	3 teams of 7 people each	Traditional and agile enterprises	Schwaber and Scrum Org (2018)
Spotify	Provides a people-driven, autonomous set of agile practices that reflect value creation which scales while stressing the importance of the culture and network	250 to 300 people	Multinational enterprises similar to Spotify	Kniberg and Ivarsson (2012)
Recipe for Agile Governance in the Enterprise (Rage)	Provides practical and standardised ‘recipes’ for enterprises to develop software applications and guidance for how to develop new recipes that enable effective governance in a wide variety of situations	Unspecified	Traditional and agile enterprises	Thompson (2016)

There are considerable similarities between the different frameworks described in Table 1. In terms of principles, practices and artefacts, they all rely on agile values to deliver solutions to organisations (Theobald et al., 2019). However, they present different challenges, and they have received different responses from organisations when it comes to their adoption (Version One, 2019; IQbusiness, 2019; KPMG, 2019), with many organisations using them as a mean of providing portfolio management capability to a set of agile initiatives.

2.3 Agile portfolio management

There are two approaches to portfolio management, i.e., agile portfolio management (APM) and predictive portfolio management (TPM). These two approaches have substantial differences (Kaufmann et al., 2020) which are based on the nature and structure of the components within the portfolio and the management approach used for these components (Stettina and Schoemaker, 2018).

Agile portfolio management is different from predictive portfolio management, as it handle several agile projects (Dingsøyr and Moe, 2014) which are flexible, and it is feedback driven with frequent and intermediate delivery, thus enabling swift change of priorities across portfolio components (Stettina and Schoemaker, 2018). It is envisaged to be an improvement of efficiency, transparency and management style in comparison to the predictive portfolio management approach (Laanti and Kangas, 2015; Laanti et al., 2015).

While scaling agile practices are sometimes confused with portfolio management or considered as providing portfolio management capability to agile practices, Rautiainen et al. (2011) consider them as two completely separate disciplines. Sweetman and Conboy (2013) suggest that more research is needed to unpack the relationship between them. Rautiainen et al. (2011) advise that organisations intending scaling agile to enterprise level and enjoying the benefits of agile project management in today's fast-moving and uncertain organisational environment should "*consider introducing portfolio management to help support scaling agile software development*". This, according to Horlach et al. (2018), requires also a change in the nature of agile to take agile beyond the limits of principles set out in the Agile Manifesto and specific agile methods, to "*encompasses all approaches in order to develop the ability to sense unpredictably change and respond accordingly*".

Furthermore, the validity of existing large-scale frameworks that address large-scale developments is questioned (Gustavsson, 2019). Putta (2018) identifies numerous gaps related to scaling agile practices and scaling frameworks that are used. As expressed by Paasivaara (2017), these frameworks lack proven results on their implementation and clarity on their end goals or purpose. They are limited as they are developed with the assumption that there will be only 5–10 teams executing projects (Sweetman et al., 2014). Further investigations into scaling agile practices and their related frameworks are recommended (Putta, 2018).

This study focussed on uncovered the relevance of scaled agile practices to APM.

2.4 Conceptual perspective of portfolio management in a dynamic and complex environment

Through a narrative review approach, referred to sometimes as a semi-structured review (Snyder, 2019), relevant literature was identified and assessed in order to develop a conceptual framework for portfolio management in a dynamic and complex environment beyond the boundaries of a specific approach, life cycle, or process. The rationale for and appropriateness of this review approach compared to others such as systematic review and integrated review is its ability to generate conceptual frameworks (Fink, 2014; Ward et al., 2009) and its suitability for information systems research (Paré et al., 2015). Numerous narrative review processes are suggested in the literature (Levy and Ellis, 2006 vom Brocke et al., 2009). Snyder (2019) advise researcher to adopt or develop a process that is appropriate for the specific study that is being undertaken. A four-phase process, similar to the one used by Ward et al. (2009) was applied and it included scoping, searching strategy, selection of literature, and thematic analysis.

1 The scope of review could not be limited to a specific database but had to be broad enough to facilitate access to a wide range of literature from all possible sources, as long as the content was relevant to the subject of the investigation. This was to take into consideration the broadness of the portfolio management discipline, and its multidisciplinary approach that include many other disciplines in its scope (Ahmad et al., 2017), cutting across industries and sectors (Stretton, 2021). The ultimate intention was to collate all recurring constructs relevant and critical to portfolio management thematically to provide a comprehensive view of the discipline.

2 The first step in developing and implementing a search strategy was to determine the main research topics based on the search term that could be identified. Available literature such as seminal books, academic contributions recommended by experts whose work focuses on portfolio management, and frameworks and standards on portfolio management with a wide international recognition were appraised. This resulted in (1) Strategic management, (2) Organisational environment, and (3) Portfolio management or project portfolio management being retained as three main topics. As the appraisal of the initial literature proceeded, several themes or topics related to these main topics emerged as per Table 2.

A comprehensive search strategy with no limitations to any preselected journal was deployed as follows: Firstly, specific databases believed to be more likely to provide relevant and high-quality results were used. These were Science Direct, Emerald, EBSCO, JSTOR, IEEE Xplore, Wiley and Taylor & Francis Online. Secondly, other search engines and software such as Google Scholar, Publish or Perish, and Ujoogle were used to retrieve literature from a variety of sources other than individual databases. Lastly, the snowballing technique was applied by using the reference list of reviewed literature to identify more focused and relevant literature until saturation was reached. The review focussed on portfolio management, organisational strategy, organisational environment, and the symbiosis between them, as they are fundamental to the research question.

3 A purposive sampling technique coupled with specific inclusion criteria were applied through the reading of the title, abstracts, introduction, and conclusion, or sometimes paging through the publication to reduce the huge amount of retrieved literature to a

manageable, quality, and relevant set. The selection process was undertaken carefully and criteria were applied rigorously to ensure a balance between quantity and quality in the selected literature, thus guaranteeing trustworthiness of the review (Cruzes and Dyba, 2011). These criteria are:

a peer-reviewed literature with reference list and displaying scientific soundness

b relevant to portfolio management practices, or its role in organisational strategy, or its applicability in a dynamic and complex environment

c relevant to strategic management or organisational environment

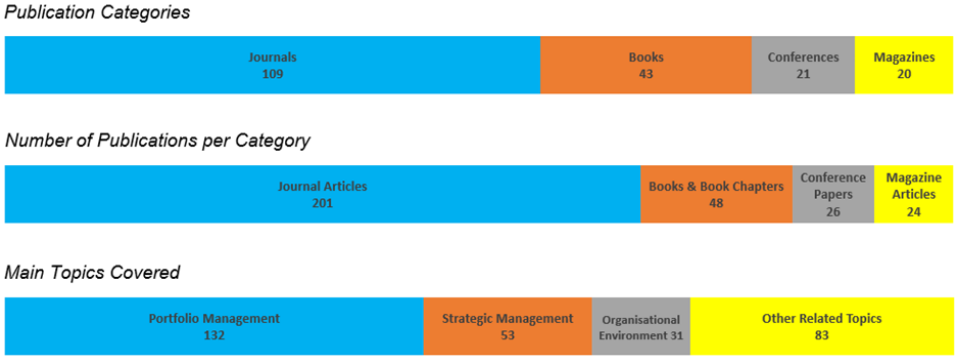
d written in English.

The selection resulted in 299 publications being retained for further analysis as per Figure 2.

Table 2 Literature research topics

Strategic management	*Organisational environment*	*Portfolio management*
• Strategy formulation • Strategy implementation • Deliberate strategy • Emergent strategy • Strategic learning • Strategic flexibility	• Complex environment • Dynamism environment • Environmental uncertainties • Organisational learning • Organisational flexibility	• Portfolio management practices • Portfolio management success • Portfolio management tools and techniques • Portfolio management complexity

Figure 2 Selected publications (see online version for colours)



4 A read-through process was undertaken of the entire set to determine the depth and breadth of the retained material and to gain an initial idea of the dominant perspective of portfolio management. This was followed by an initial review through which recurring themes were identified and segments of text dealing with them were labelled on the printed material before their extraction to reduce overlap. The initial

review of the retained literature resulted in four themes as the areas of interest under which the contributions of each publication were captured as advised by Jabareen (2009). These were portfolio management goals and their relevant practices, the role of portfolio management in organisational strategy, portfolio management in a dynamic and complex environment, and uncertainty and governance in portfolio management. The detailed review based on these four themes led to 9 components and 14 subcomponents recurring in most of the reviewed literature. Using these components, subcomponents and the relationship between them, a conceptual framework for portfolio management in a dynamic and complex environment was then developed as guided by Cruzes and Dyba (2011).

There is wide recognition of the role portfolio management plays in both strategy formulation and implementation (Oostuizen et al., 2018; APM, 2019) and the uniqueness of this role in a dynamic and complex environment. The conceptual framework capitalises on the foundational role of portfolio management in organisational strategy by identifying the practices necessary for portfolio management to meet its objectives and achieve its purpose, and to ensure that portfolio management can successfully fulfil its role while navigating the complexity and dynamism of the business environment.

The conceptual framework establishes portfolio management as the central building block for strategy formulation and implementation (García-Melón et al., 2015; Clegg et al., 2018) and includes both deliberate strategy and emergent strategy capabilities as strongly supported in the literature (Kopmann et al., 2017; Kaufmann et al., 2020; Grünig and Kühn, 2018; Johnson et al., 2017).

The achievement of portfolio management's core purpose is supported by four portfolio management goals that are strongly represented in the literature (Turetken et al., 2017; Stojanov et al., 2015; Borjy et al., 2019; Yamakawa et al., 2018a). These goals are align portfolio with organisational strategy, maximise the value of the portfolio, seek balance in the portfolio and pick the right number of components (Ahmad et al., 2017; Rautiainen et al., 2011). They are presented in Table 3 with the supporting literature.

Table 3 Portfolio management goals

	Previous empirical and conceptual contributions	*Align the portfolio with the strategy*	*Maximise the value of the portfolio*	*Seek Balance in the portfolio*	*Pick the right number of components*
1	Ahmad et al. (2017)	χ	X	χ	χ
2	Borjy et al. (2019)	χ	X	χ	χ
3	Bridges (1999)	χ	X	χ	
4	Castro and Ferreira (2020)	χ	X	χ	χ
5	Cooper and Edgett (2001)	χ	X	χ	χ
6	Cooper et al. (1997a, 1997b)	χ	X	χ	
7	Cooper et al. (1999)	χ	X	χ	
8	Cooper et al. (2001)	χ	X	χ	
9	Cooper et al. (2002)	χ	X	χ	χ

Table 3 Portfolio management goals (continued)

	Previous empirical and conceptual contributions	*Align the portfolio with the strategy*	*Maximise the value of the portfolio*	*Seek Balance in the portfolio*	*Pick the right number of components*
10	Dawidson (2006)	χ	X	χ	χ
11	Dde Souza et al. (2015)	χ	X	χ	
12	Hunt et al. (2008)	x	X	x	x
13	Kohlborn et al. (2009)	χ	X	χ	
14	Martinsuo and Killen (2014)	χ	X	χ	
15	Martinsuo and Lehtonen (2007)	χ	X	χ	
16	Meifort (2016)	χ	X	χ	χ
17	Meskendahl (2010)	χ	X	χ	
18	Morcos (2008)	x	X	x	x
19	Oosthuizen et al. (2016)	χ	X	χ	χ
20	Petit (2011)	χ	X	χ	
21	Rautiainen et al. (2011)	x	X	x	x
22	Smeekes et al. (2018)	χ	X	χ	χ
23	Stojanov et al. (2015)	x	X	x	x
24	Turetken et al. (2017)	x	X	x	x
25	Vacík et al. (2018)	χ	X	χ	
26	Yamakawa et al. (2018b)	χ	X	χ	χ

A further review of the literature on each of these four goals of portfolio management revealed a set of practices that enable the accomplishment of each goal. Figure 3 illustrate the link between strategy formulation and implementation as the main purpose of portfolio management, the four goals of portfolio management and the practices related to each portfolio management objective.

In light of the complexity and dynamism inherent in environments in which organisations operate and in the very nature of an IT portfolio, the resulting changes and unpredictability that lead to uncertainties (Martinsuo et al., 2014), empirical research suggests practices that can assist portfolio management in reaching its goals and ultimately achieving its purpose (Dönmez and Grote, 2018). Four such practices, strategic and organisational agility (Prange and Hennig, 2019), strategic and organisational learning (Gardiner, 2018; Kohtamäki and Farmer, 2017), portfolio governance (Frey, 2014; Ginger Levin and John Wyzalek, 2014) and rigorous uncertainty management (Jerbrant and Gustavsson, 2013; Martinsuo and Geraldi, 2020) are included in the framework and constitute the facilitating components of the framework. Figure 4 illustrates these four practices, identified as facilitating themes or components of portfolio management that are essential for the management of a portfolio in a dynamic environment.

Figure 3 Portfolio management purpose, goals and key practices as core components (see online version for colours)

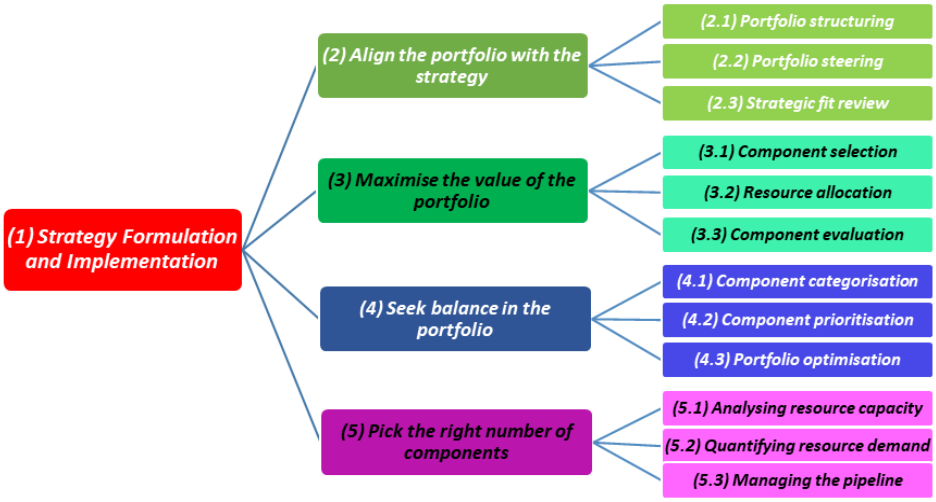
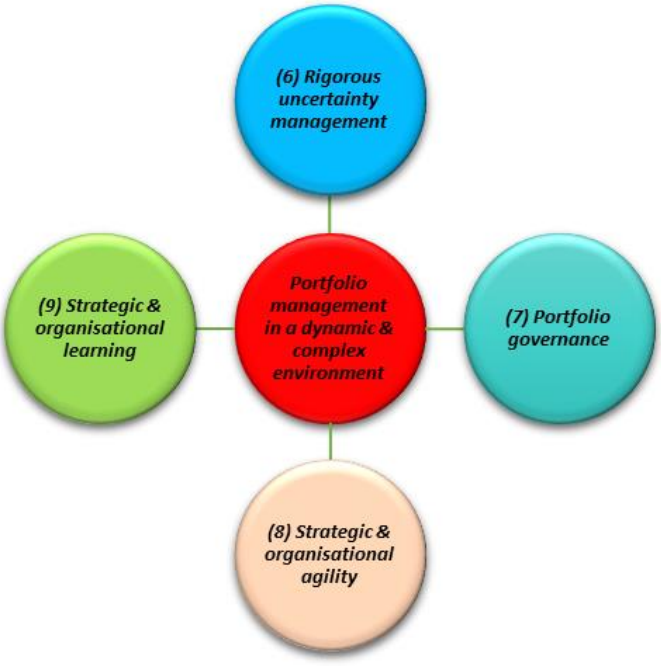


Figure 4 Facilitating components for portfolio management in a dynamic environment (see online version for colours)



Strategy formulation and implementation with its two subcomponents (Deliberate Strategy and Emergent Strategy) constitute the starting point of the conceptual framework. By combining it with the result of literature review in Figure 3 and those in Figure 4, a total of 9 components and 16 subcomponents have been built into the conceptual framework as illustrated in Figure 5.

Figure 5 Initial conceptual framework components and subcomponents (see online version for colours)

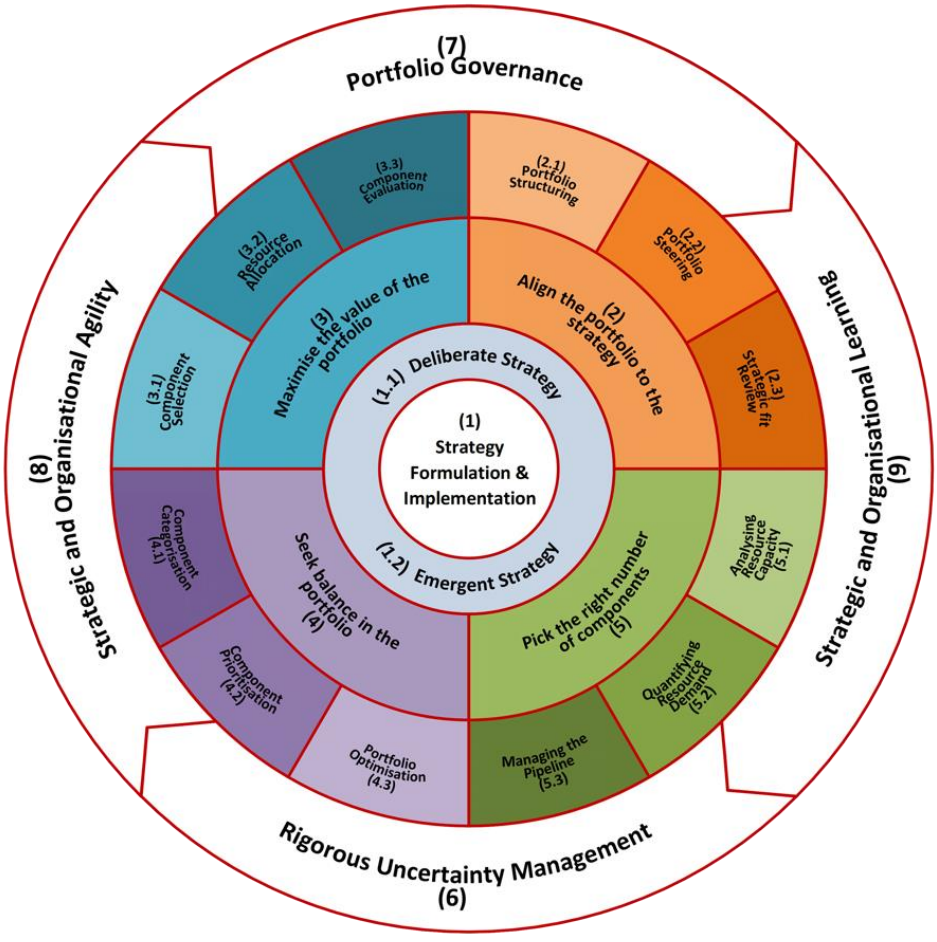


Figure 5 identifies strategy formulation and implementation as the core focus of portfolio management, with aligning the portfolio with the strategy, maximising the value of the portfolio, seeking balance in the portfolio and picking the right number of components as the four core components with their practices (subcomponents) described in the inner part of the diagram. For portfolio management to achieve its objectives successfully, portfolio governance, strategy and organisational learning, strategy and organisational agility and rigorous uncertainty management are identified as the facilitating components of portfolio management in the outer part of the diagram.

3 Methodology

A qualitative documentary analysis (QDA) approach was used to assess how relevant are scaled agile practices to APM. A QDA is an emergent process that consists of an immersion in the subject of investigation to have a conceptually informed conversation

with a set of documents while using systematic and constant comparisons across documents (Hesse-Biber and Leavy, 2010). The documents are rigorously and systematically located, identified, retrieved and analysed (Altheide, 1987; Altheide and Schneider, 2012; Wach and Ward, 2013), to uncover underlying meanings, themes and patterns (Wood et al., 2020). This method enhances the "researcher's ability to summarise, describe, interpret, review and explicate" the content of documents being analysed (Nyandongo, 2012). Based on the research question and evidence needed (Gorichanaz and Latham, 2016; Bazeley, 2013), the QDA was coupled with content analysis for data collection and analysis (Wood et al., 2020; Bryman, 2004). Considered by Bowen (2009) as "*the process of organising information into categories related to the central research question*", it assisted in identifying and organising scaled agile practices relevant to the conceptual view of portfolio management in a dynamic and complex environment.

QDA was preferred because the quality and popularity of the SAFe to be analysed is such as no interview, observation, focus group or other form of talk could have provided data as comprehensive and rich as the data that were extracted from these documents (Bowen, 2009). The quality of their data was already assessed when these framework were published (Hesse-Biber and Leavy, 2010). QDA capitalised on the rich breath within documents to organise data around topics in a structured approach (Bowen, 2009). It is recognised as a legitimate method that "can be used as a stand-alone research method" (Chinedu and Wan Mohamed, 2017), and "*entire studies can be conducted with only documents*" (Glaser and Strauss, 1967, as cited in Bowen, 2009).

While numerous perspectives on a QDA process are suggested in the literature (Flick, 2009; Flick, 2018; Bowen, 2009; Altheide et al., 2008; Kuckartz, 2019; Dalglish et al., 2020; May, 2011; Coffey, 2014; Chenail, 2012a, 2012b), this research uses (Wood et al., 2020). Wood et al. (2020) QDA process which result from the review of many of the above studies, comprise two subprocesses of

1 constructing the corpus

2 analysing the documents.

3.1 Constructing the corpus

The focus of the first subprocess of QDA was to search for the documents of interest and select a sample that should be analysed (Wood et al., 2020; Flick, 2009, 2018). To effectively identify and select documents of interest, a review of literature on current SAFe was undertaken. A deeper understanding of these practices was developed and an informed and rational decision was made on the choice of frameworks that could provide rich veins of insight into the operationalisation of portfolio management as per the conceptual framework. The review here contributed also toward an adequate engagement with these documents during analysis. This subprocess was done in two steps:

a *Sourcing documents*

The search for documents of interest via the literature review, industry reports and consultation with seven frameworks for scaling agile practices (considered to be APM). These frameworks, illustrated in Table 1, were sourced to assess their quality and the

extent to which they covered the type of evidence needed to answer the research question.

b *Selecting documents*

The decision on which of the identified frameworks should be retained for further and profound analysis was made based on rational considerations using specific inclusion criteria (Wach and Ward, 2013). These are:

- the relevance of the document to the research problem and purpose
- the extent to which the document is used in the industry
- the extent to which the content of the document fits the conceptual framework developed and covers the subject of the investigation (comprehensive/selective)
- the level of detail provided
- the purpose of the document, the reason it was produced and the targeted audience
- the source of information (who contributed to the development of the document).

This phase, referred to as triaging by Yin (2009), ensures that the selected documents are the most significant that will enable the identification of relevant and unbiased contributions to the study (Wood et al., 2020). The focus in this study was on quality rather than quantity of documents (Bowen, 2009), as increasing the number of documents does not always translate into richness of data (Graneheim et al., 2017). After applying the selection criteria, only SAFe and Scrum@Scale qualified for further analysis.

The extent to which organisations consider each scaling agile framework in Table 1 as a viable option in scaling agile practices to portfolio management was an important factor in determining which framework to retain for further analysis. This was informed by the consideration that the study sought to establish accepted scaled practices that organisations are using which could add value to the conceptual considerations.

Dingsøyr et al. (2018b) note that although multiple SAFe exist, very few of them are used. The State of Agile surveys (Version One, 2015, 2016, 2017, 2018, 2019) indicate that from 2015 to 2019, SAFe (Leffingwell, 2019) and the Scrum of Scrum framework, which is formalised into the Scrum@Scale Guide (Sutherland, 2019a), dominated the industry. This dominance has also been corroborated by the recent survey conducted by KPMG (2019).

Both researchers and practitioners have attested to the dominance of SAFe (Leffingwell, 2019). Komus and Kuberg (2017) and Laanti and Kettunen (2019) report a SAFe usage rate of 50% and 80% respectively, while Leffingwell (2019) indicates a 70% increased interest in SAFe, among Fortune 100 companies. The Scrum@Scale Guide is recognised as the second most used SAFe Moreover (Theobald et al., 2019) and the scrum framework that serves as the foundation of Scrum@Scale is lauded as the most used and most successful agile framework, with Version One (2019), KPMG (2019) and IQbusiness (2019) establishing a usage rate of 54%, 84% and 95%, respectively. It is for the above reasons that SAFe, and the Scrum@Scale Guide were retained as the agile blueprint for this study.

3.2 Analysing documents

After sourcing the retained standards and frameworks, a systematic analysis of the entire contents of each was required to identify activities relevant to portfolio management. Hesse-Biber and Leavy (2010) state that for documents to be systematically analysed, a regulative and flexible protocol should be developed with specific step-by-step phases to guide the exploration and examination of documents for data collection and constant comparisons to clarify themes, delineate patterns and refine conceptually. In this section, specific step-by-step phases followed as well as the rules applied for decision making are detailed.

a *Understanding and preparing the material and data*

The selected standards and frameworks were read systematically, sequentially, and completely to get a broad overview of each. This uncovered the portfolio management practices of each and the activities for the successful management of portfolios (Kuckartz, 2019). It was found that each framework had a completely different perspective and structured its practices differently, sometimes using different terminology. Furthermore, these frameworks were found to be complex and containing many activities mixed with tools and steps from a process and life cycle perspective and discussed across many pages of dense text. Extensive information on other aspects was included but did not lead to a specific activity. While some of the activities were manifested and obviously stated, other activities were latent, expressed in underlying and inferred meaning.

Given the challenge posed by the structure of frameworks and considering that the research focus of this exercise was to uncover portfolio management activities relevant to the conceptual framework, it was then important to proceed with data reduction in order to separate the actual portfolio management activities from the rest of the content of each framework. This was done to single out all manifest and latent activities and facilitate the subsequent analysis while attempting to stay true to the original text (Wood et al., 2020; Bengtsson, 2016). Latent activities were identified through latent pattern content analysis which "*seeks to establish a pattern of characteristics in the text itself*", with a clear contrast to the latent pattern content analysis that leverages the researcher's own interpretations of the meaning of the text (Kleinheksel et al., 2020).

b *Data reduction*

The data reduction phase was initiated to model and simplify the text for ease of analysis as a means of dealing with the richness of huge and complex information in text before analysis and inference, without losing any significant information (Ahmed, 2010; Punch, 2013). Data were condensed to let go of the unimportant information that did not relate to the aim of the study (Bengtsson, 2016). This condensation did not ascribe interpretation, but it instead "*shortens a meaning unit as much as possible while preserving the original meaning identified*" (Kleinheksel et al., 2020). The unit of meaning (coding unit) in this study was a statement that relayed an activity fully expressed. In the case of a latent activity spread over multiple paragraphs or a section, the text was reduced to a specific activity based on connections and characteristics in the text, which could be discovered by any coder (Kleinheksel et al., 2020).

The data reduction phase in this study was conducted using predictive coding logic defined by Saldaña (2015) as essential groundwork for further coding and analysis that provides a "*categorised inventory, tabular account, summary, or index of the data's contents*". For each framework, a table was created based on the content areas (sections) of that framework under which specific activities are found. A brief purpose of each content area was captured to guide the reduction phase. Using these content areas of each framework (document) as inductive categories for analysis, all activities falling under that content area in the main document were identified and captured in a summarised format next to that content area (category) in Table 4.

Table 4 Content areas of frameworks and standards used for data reduction

SAFe dimensions (DI)	*Scrum@Scale components (CO)*
• Lean-thinking people and agile teams • Lean business operations • Strategy agility • Strategy and investment funding • Agile portfolio operations • Lean governance • Learning organisation • Innovation culture • Relentless improvement • Portfolio level	• Executive action team backlog and responsibility • Continuous improvement and impediment removal • Cross-team coordination • Deployment • Executive Meta scrum team • Strategic vision • Backlog prioritisation • Backlog decomposition and refinement • Release planning • Team-level process • Product and release feedback • Metrics and transparency • Product owner team • Chief product owner • Scrum of Scrums master

It should be noted that while the name of a content area of a standard or framework might not suggest a direct link to portfolio management, portfolio management related activities were still found under these content areas.

c *Extracting relevant activities*

The data extraction phase consisted of reviewing the activities that were identified during the reduction phase and coded in the data reduction file for each framework and identifying those that were relevant to the conceptual framework developed as part of the literature review. Using a concept-driven approach of category development where categories are deductively derived from literature (Kuckartz, 2019 Elo and Kyngäs, 2008), the components of the framework developed were used as predefined categories for data extraction. An extraction sheet was created and each framework serves as a column under which activities relevant to the framework were coded in the raw data

corresponding to the component of the framework to which they relate. Table 5 illustrates the extraction sheet used.

Table 5 Data extraction sheet (activity)

	Categories: Framework components	*SAFe*	*Scrum@Scale*
1	Strategy formulation and execution		
	1.1 Deliberate strategy		
	1.2 Emergent strategy		
2	Align the portfolio with the strategy		
	2.1 Portfolio structuring		
	2.2 Portfolio steering		
	2.3 Strategic fit review		
3	Maximise the value of the portfolio		
	3.1 Component selection		
	3.2 Resource allocation		
	3.3 Component evaluation		
4	Seek balance in the portfolio		
	4.1 Component categorisation		
	4.2 Component prioritisation		
	4.3 Portfolio optimisation		
5	Pick the right number of components		
	5.1 Analysing resource capacity		
	5.2 Quantifying resource demand		
	5.3 Managing the pipeline		
6	Rigorous uncertainty management		
7	Portfolio governance		
8	Strategic and organisational agility		
9	Strategic and organisational learning		

The extraction from the reduced data files to predefined categories derived from the conceptual framework took place by thoughtfully reading each activity in the reduced file and analysing and comparing its content with each of the categories based on the activity description. If an activity did not fit a category, it was disregarded. When an activity as detailed fit a category as per its purpose, it was highlighted and the category concerned was noted in the margin (Dalglish et al., 2020). That activity was then copied and pasted in the extraction sheet in a row related to the category to which it was relevant.

d *Integrating similar activities across standards*

The integration phase served to deal with distilling data and reducing overlaps between the two documents used for the scaling agile approach. The integration phase consisted of comparing and relating activities across frameworks and analysing patterns, leading to

some results being synthesised, decontextualised and abstracted from the individual framework to provide a more inclusive view of activities found to be similar or complementary (Wood et al., 2020). The researcher, acting as the primary instrument of data collection and analysis (Hesse-Biber and Leavy, 2010), used the skills, understanding and knowledge gained through the initial review to comprehensively deal with the integration phase while striving for and maintaining a balance between objectivity and sensitivity. Activities within the same components were consistently checked and rechecked, scrutinised, compared and contrasted to establish how each activity was similar to or different from another, and whether two or more activities could be consolidated. Specific rules were applied throughout the integration.

3.3 Trustworthiness

Various strategies were deployed to ensure the credibility, transferability, dependability and confirmability criteria inherent to the naturalistic paradigm of qualitative research (Lincoln and Guba, 1985). This includes the triangulation of data from different frameworks which guarded against single data source bias, helped attain rigour and added richness and in-depth understanding (Patton, 1990; Hesse-Biber and Leavy, 2010; Noble and Heale, 2019; Graneheim and Lundman, 2004). The creation of explicit data collection and integration protocols that was tested on a section of each framework for validity and reliability before systematic and disciplined application to all the documents retained for analysis ensured quality results, process replicability, and enhanced validity (Hesse-Biber and Leavy, 2010). During the analysis subprocess, decisions made and rules applied were recorded to keep an audit trail of the way data were reduced and activities were extracted and integrated to populate the conceptual framework, thus enabling the legitimacy and rigour of the findings (Graneheim and Lundman, 2004; Wood et al., 2020). Peer debriefing was used to ensure that frameworks sampled were those that best represented current portfolio management practices in the industry and these frameworks were able to tell about them so that the results are transferable (Graneheim et al., 2017).

4 Results

4.1 Analysing the scaled agile framework (SAFe)

4.1.1 Overview of SAFe

The framework comprises of seven core competencies that constitute the lens through which it can be understood and implemented, three of which focus on strategy support (lean portfolio management, organisational agility, and continuous learning culture) and another three on execution (enterprise solution delivery, agile product delivery, and team and technical agility) with lean-agile leadership serving as the foundation. Each competency has a set of dimensions that encompass skills, knowledge, roles, artefacts, values, practices and principles (Gustavsson, 2019) contributing to the delivery of business agility.

SAFe has four different configurations, namely essential SAFe, large solution SAFe, portfolio SAFe and full SAFe, each representing a different development environment. The essential configuration is the foundational building block of all other configurations, organised around the agile delivery train to provide incrementally efficient and effective solutions. When multiple agile release trains are required to deliver larger and complex solutions, large solution SAFe is used to organise practices and principles around solution trains. The portfolio SAFe configuration takes a strategic perspective (Razzak et al., 2018) and organises development around value streams to achieve business agility. The combination of all these configurations results in a full SAFe configuration for the largest enterprises, with three layers of practices, i.e., the essential, the large solution and the portfolio layer, separated by arbitrary boundaries (Stojanov et al., 2015).

For this research, the competencies related to portfolio and the portfolio configuration layer are the only ones that were analysed.

4.1.2 Reducing SAFe to specific activities

The second phase of the analysis was therefore intended to uncover meaningful and relevant passages that contain high-level portfolio management activities. The multiplicity of competencies with their respective dimensions, configurations and layers, each with its specific principles and practices, has earned SAFe the criticism of being heavy, complex, prescriptive, complicated and difficult to understand (Razzak et al., 2018; Dingsøyr et al., 2018b). A process of data reduction was therefore initiated to model and simplify the text for ease of analysis and comparison.

Using the nine dimensions related to portfolio management and one portfolio-level configuration that embodies portfolio management activities as categories for coding, 64 related activities identified in SAFe were summarised and provisionally coded in the data reduction table until saturation was reached, without affecting the latent content of the source document. All activities were coded regardless of whether they would later be found relevant or not to the conceptual framework during further analysis to ensure that the summary remained comprehensive. Activities were coded under their respective dimensions related to portfolio management and portfolio-level configuration as in SAFe to ensure their traceability in the source document during later analysis for context if necessary.

Table 4 lists these dimensions and their related activities to provide a summarised view of portfolio management practices as defined by SAFe. The research notations used are DI(n) to denote the framework dimensions inclusive of the portfolio-level configuration, with n as the unique dimension number, and A(n) to denote the activities under each dimension, with n as the unique activity number. To relate activities to their specific dimension, activities are therefore denoted using both the denotation of the dimension under which it falls and the activities themselves as DI(n)A(n). These notations identify activities and their related dimensions – they are not abbreviations of these dimensions or activities (Saldaña, 2015). By illustration, the Lean-Thinking People and Agile Teams is the first dimension and coded as DI1 and its first activity A1 is coded in Table 6 as DI1A1.

Table 6 Portfolio management activities derived from SAFe

		Activities	
Dimension	*Purpose*	*Code*	*Description*
		Organisational agility	
Lean-Thinking People and Agile Teams DI1	Train everyone involved in solution delivery on lean and agile methods so that they embrace and embody lean and agile principles and practices	DI1A1	Develop agile technical and business teams by training them in lean and agile principles, values, and practices to enable them to reach a level of unprecedented performance
		DI1A2	Develop an agile working environment that provides HR practices, working conditions and physical space that will render the team productive
		DI1A3	Develop agile HR operations for hiring, engaging, and retaining personnel to realign the people approach with the lean-agile mindset, principles and practices
		DI1A4	Implement the necessary tooling to control the workflow in order to ensure that bottlenecks and improvement opportunities are identified
Lean Business Operations DI2	Use lean-agile principles and practices to relentlessly improve business process to deliver value	DI2A1	Identify and map operational and developmental value stream to improve business operations and eliminate non-value-creating activities
		DI2A2	Visualise and monitor flow to continuously improve performance and identify bottlenecks
		DI2A3	Visualise and limit work-in-progress (WIP) to optimise the flow by reducing batch size and managing key length
Strategy Agility DI3	Develop the ability to change and implement new strategies quickly and decisively when necessary, and to persevere on the strategies that are working -or will work – if given sufficient focus and time	DI3A1	Sense the market to understand changing market dynamics in order to prepare for response
		DI3A2	Visualise and manage the flow of new initiatives and investment via a 'build-measure-learn' lean start-up cycle while outcome hypothesis is tested before significant commitment
		DI3A3	Implement changes in strategy by creating new cross-cutting solutions (epics) to ensure that the execution is constantly realigned with the changing business strategy
		DI3A4	Evaluate the results of a strategy using innovation accounting to inform the evolving strategy by measuring specific early economic outcomes that help validate assumptions and increase learning
		DI3A5	Reorganise around values in line with strategic changes to account for new, changed or eliminated value to ensure that there is still alignment with the strategy and to facilitate new flow

Table 6 Portfolio management activities derived from SAFe (continued)

		Activities	
Dimension	*Purpose*	*Code*	*Description*
		Lean portfolio management	
Strategy and Investment Funding Di4	Ensure that the entire portfolio is aligned and funded to create and maintain the solutions needed to meet business targets	DI4A1	Connect the portfolio to the enterprise strategy using bi-directional processes from strategic themes, budget and from the portfolio context to ensure alignment
		DI4A2	Maintain a portfolio vision and roadmap by defining the portfolio current state and envision the future state, resulting in new initiatives being identified
		DI4A3	Review the portfolio canvas to account for new information, new solutions, mergers and acquisitions and other strategic changes that can affect the portfolio value streams or solution
		DI4A4	Translate the business vision and strategy into effective technology plans of architectural initiatives that must be adaptively designed using engineering practices
		DI4A5	Establish lean budgets and guardrails to increase development throughput and fund value streams that are aligned with the strategic themes and business strategy
		DI4A6	Establish a portfolio flow process (capture, analyse, approve) to manage portfolio cross-cutting solutions (epics) throughout the portfolio life cycle
		DI4A7	Limit the number of significant and typically cross-cutting initiatives in progress to match the portfolio's capacity
		DI4A8	Visualise and limit WIP
		DI4A9	Reduce batch size and control the length of long-term development queues
		DI4A10	Establish capacity available for new development work vs. ongoing maintenance and support to objectively evaluate and originate portfolio-level initiatives
Agile Portfolio Operations DI5	Coordinate and support decentralised program execution, enabling operational excellence and decentralisation of strategy execution	DI5A1	Coordinate value streams by managing dependencies to exploit interconnection opportunities so as to provide portfolio-level capability
		DI5A2	Support program execution by using agile program management office or by empowering agile release train or solution train
		DI5A3	Foster operational excellence by improving efficiency, practices, and results to optimise business performance

Table 6 Portfolio management activities derived from SAFe (continued)

		Activities	
Dimension	*Purpose*	*Code*	*Description*
Lean Governance DI6	Actively engage relevant stakeholders to manage spending, audit and compliance, forecasting expenses and measurement	DI6A1	Forecast and budget dynamically to adjust the value stream budgets over time, taking into account the dynamic environment
		DI6A2	Decompose cross-cutting solutions (epics) to estimate in story point and forecast the cross-cutting solution (epic) size
		DI6A3	Collaboratively prioritise cross-cutting solutions (epics) using participatory budgeting with participants from different value streams to determine which cross-cutting solutions (epics) should be next for implementation
		DI6A4	Adjust value stream twice annually using participatory budgeting, noting that less adjustment impact agility and more frequent adjustment create uncertainty and inability to commit to a near-term course of action
		DI6A5	Establish metrics and measure portfolio performance to ensure the implementation of the strategy, the alignment of spending and continuous improvement of results
		DI6A6	Establish the portfolio progress towards meeting the strategic objective by conducting a portfolio sync meeting
		DI6A7	Identify and prioritise cross-cutting solutions (epics) periodically by conducting portfolio sync meetings
		DI6A8	Review value streams, program execution and governance of other portfolio components and investments via a portfolio sync meeting
		DI6A9	Measure the strategic intent using innovation accounting to reflect on leading indicators, including non-financial indicators
		DI6A10	Coordinate continuous audit and compliance with relevant standards, legal and regulatory requirements while overheads are minimised, and the flow of value is supported
Continuous learning culture			
Learning Organisation DI7	Promote the organisation's ability to transform through personal mastery, shared vision, team learning, mental models and systems thinking	DI7A1	Invest in and facilitate ongoing growth of employees to develop organisational dynamic transformation capacity necessary to anticipate and exploit opportunities
		DI7A2	Encourage and support the creation, acquisition and transference of knowledge and modification of practices to integrate newly acquired insight
		DI7A3	Nurture the intrinsic nature of people to learn, master and harness knowledge in the interest of the organisation

Table 6 Portfolio management activities derived from SAFe (continued)

		Activities	
Dimension	*Purpose*	*Code*	*Description*
Innovation Culture DI8	Establish an innovative culture that encourages frequent and non-random innovation and people to explore and experiment ideas, fix problems, improve process, and remove obstacles to productivity	DI8A1	Initiate and continuously improve an innovative culture to support creative thinking, curiosity, and ability to challenge the status quo
		DI8A2	Create an innovative workforce through training, mentoring, coaching, rewarding, recognising, and advancing people in a way that reinforces everyone as innovators
		DI8A3	Set time and build space for innovation
		DI8A4	Continuously explore the work environment and continuously experiment to identify opportunities for innovative solutions by using the Gemba practice
		DI8A5	Decentralise decision making to allow for the identification of opportunities throughout the course of building solutions, resulting in an innovative riptide to be flown back into solutions' building structures
Relentless Improvement (DI9)	Strive for perfection in order to create a better product at a lower cost but with an increased benefit while maintaining customer satisfaction	DI9A1	Pursue relentless planned and ongoing improvement effort via team retrospective, inspect and adapt processes and implement innovative planning iteration to deliver competitive advantage
		DI9A2	Prioritise and allocate resources to improvement activities to solve problems
		DI9A3	Use the iterative problem-solving approach of Plan-Do-Check-Adjust by considering problems as opportunities for improvement
		DI9A4	Optimise the entire system that produces the sustainable flow of values, quality, and customer satisfaction
		DI9A5	Measure improvement results objectively by focusing on empirical evidence, not opinion and conjecture
		Portfolio configuration	
Portfolio Level (DI10)	Align organisational strategy with portfolio execution and organise solution development around the flow of values via one or more value streams	DI10A1	Define the enterprise strategy and decide on the budget to invest in the subsequent solutions for the delivery of the strategy with the involvement of key portfolio stakeholders
		DI10A2	Continuously collaborate, communicate, and align with downstream portfolios to consider resulting emergent strategic properties to respond to a dynamic environment
		DI10A3	Establish a set of enterprise strategic objectives (strategic themes) to influence the portfolio strategy and provide context for portfolio decision making

Table 6 Portfolio management activities derived from SAFe (continued)

		Activities	
Dimension	*Purpose*	*Code*	*Description*
Portfolio Level (DI10)		DI10A4	Align the portfolio with the enterprise strategy using strategic objectives (strategic themes)
		DI10A5	Define the portfolio vision and the way to achieve the portfolio's objectives and ultimately the broader enterprise strategy
		DI10A6	Identify viable strategic options to fill the gap between the current state and the envisioned future state of the portfolio
		DI10A7	Periodically review and update the portfolio vision and the portfolio canvas to account for changes, the learning taking place, and the dynamism in the business environment
		DI10A8	Define and approve cross-cutting value stream solution development initiatives to deliver business value (business epics) and the architectural runway (enabler epics) to support the business or technical needs
		DI10A9	Manage the flow of portfolio cross-cutting solutions (epics) to match demand to capacity while considering WIP and dealing with bottlenecks
		DI10A10	Review and analyse portfolio cross-cutting solutions (epics) to approve, prioritise or reject as a result of a feasibility study through the management of the flow of portfolio cross-cutting solutions
		DI10A11	Periodically review, reprioritise, and schedule the implementation of the cross-cutting portfolio solutions (epics) within the portfolio backlog
		DI10A12	Organise and take steps to implement solutions (value streams) by providing continuous flow of values to enable the organisation to achieve its strategy
		DI10A13	Manage interconnections and dependencies to exploit their resulting opportunities, emerging capabilities and benefits while addressing their challenges
		DI10A14	Provide effective financial control over all investments to avoid compromising business benefits by using lean budget

Table 6 Portfolio management activities derived from SAFe (continued)

		Activities	
Dimension	*Purpose*	*Code*	*Description*
Portfolio Level (DI10)		DI10A15	Balance investment in different horizons for better decision making and strategic alignment while taking into consideration growth without neglecting the current performance
		D10A16	Define policies and practices for budgeting, spending and governance to ensure that both long- and short-term strategies are addressed, and different investments are approved appropriately

4.2 Analysing the Scrum@Scale framework

4.2.1 Overview of Scrum@Scale

The framework provides a means of coordinating multiple teams effectively to achieve linear scalability (Sutherland, 2019b) and integrate isolated teams across geographical areas (Sutherland et al., 2007, 2009; Sutherland, 2010). The Scrum@Scale Guide is divided in two cycles, the product owner cycle, and the scrum master cycle, each with a set of components, including roles, events, artefacts, and rules. The scrum master cycle, which deals with "the coordination of the how" includes as components the executive action team backlog and responsibilities, continuous improvement and impediment removal, cross-team coordination, and deployment. The product owner cycle, which focuses on "the coordination of the what", includes among its components the executive metascrum team, strategic vision, backlog prioritisation, backlog decomposition and refinement, and release planning. These two cycles are connected by team process, product, and release feedback, as well as metrics and transparency. They are also supported by scaled structures such as the scrum of scrum master, the chief product owner and product owner team.

Of relevance to this research are the components of the Scrum@Scale Guide, independent of their life cycles. Each component has a specific purpose and key activities to undertake to achieve its purpose.

4.2.2 Reducing the Scrum@Scale framework to specific activities

Although the Scrum@Scale Guide is branded as lightweight and easy to understand, it contains levels of details that include scaled roles, scaled events, and enterprise artefacts, as well as the rules that bind them together, thus making it complex for analysis. However, the systematic reading process uncovered 15 components within scrum that embody scaled agile activities, guided by the Scrum@Scale Guide's values and pillars.

Using the 15 components (content areas) of the Scrum@Scale Guide that possibly embodied portfolio management activities as categories for coding, 66 related activities identified in the Scrum@Scale Guide were summarised and provisionally coded until saturation was reached, without affecting the latent content of the source document. All activities were coded regardless of whether they would later be found relevant or not to

the conceptual framework during further analysis to ensure that the summary remained comprehensive.

Table 7 describes these components and their related activities to provide a summarised view of SAP as defined by the Scrum@Scale Guide. The research notations used are CO(n) to denote the guide components, with n as the unique component number, and A(n) to denote the activities under each component, with n as the unique activity number. To relate activities to their specific components, activities are therefore denoted using both the denotation of the component under which it falls and the activities themselves as CO(n)A(n). These notations identify activities and their related components – they are not abbreviations of these components or activities (Saldaña, 2015). By illustration, the Executive Action Team Backlog and Responsibility component is the first component and coded as CO1 and its first activity A1 is coded in the same table as CO1A1.

Table 7 Portfolio management activities derived from Scrum@Scale

		Activities	
Components	*Purpose*	*Code*	*Description*
The Scrum master cycle – coordinating the how			
Executive Action Team Backlog and Responsibility CO1	Create and operate an agile ecosystem and reference model with specific guidelines and procedures	CO1A1	Create an agile operating system including corporate operational rules, procedures, and guidelines to enable agility
		CO1A2	Create an organisational transformation backlog which contains a prioritised list of the agile initiatives that need to be accomplished
		CO1A3	Measure and improve the quality of scrum in the organisation
		CO1A4	Build capability within the organisation for business agility
		CO1A5	Create a centre for continuous learning for scrum professionals
		CO1A6	Support the exploration of new ways of working
Continuous Improvement and Impediment Removal CO2	Remove any impediment that might even scale to cripple productivity so as to ensure a scale-free architecture	CO2A1	Identify impediments and reframe them as opportunities
		CO2A2	Ensure visibility in the organisation to effect change
		CO2A3	Maintain a healthy and structured environment for prioritising and removing impediments
		CO2A4	Verify the resulting improvements
Cross-team Coordination CO3	Provide a mechanism to facilitate cooperation among teams working on the same product	CO3A1	Coordinate similar processes across multiple related teams
		CO3A2	Mitigate cross-team dependencies to ensure that they do not become impediments
		CO3A3	Maintain alignment of team norms and guidelines for consistent output

Table 7 Portfolio management activities derived from Scrum@Scale (continued)

		Activities	
Components	*Purpose*	*Code*	*Description*
Deployment CO4	Ensure effective and efficient deployment of products and increments	CO4A1	Deliver a consistent flow of valuable finished product to customers
		CO4A2	Integrate the work of different teams into one seamless product
		CO4A3	Ensure high quality of the customer experience
The product owner cycle – coordinating the what			
Executive Metascrum Team CO5	Align all the teams with the overall organisation vision and strategic priorities to achieve a common purpose	CO5A1	Set the strategic priorities of the entire organisation
		CO5A2	Develop the organisational product backlog
		CO5A3	Align all teams with common organisational goals
		CO5A4	Determine and decide on change to the organisational strategy, funding and resource allocation and deployment
		CO5A5	Determine and decide on change to the organisational funding and resource allocation and deployment
		CO5A6	Determine and decide on change to the organisational backlog
Strategic Vision CO6	Formulate and disseminate the strategic vision both internally and externally	CO6A1	Clearly align the entire organisation along a shared path forward
		CO6A2	Compellingly articulate why the organisation exists
		CO6A3	Describe what the organisation will do to leverage key assets in support of its mission
		CO6A4	Respond to rapidly changing market conditions
Backlog Prioritisation CO7	Prevent waste by identifying and removing negative or little-value activities	CO7A1	Identify a clear ordering for products, features, and services to be delivered
		CO7A2	Reflect value creation, risk mitigation and internal dependencies in ordering of the backlog
		CO7A3	Prioritise the high-level initiative across the entire agile organisation prior to backlog decomposition and refinement
Backlog Decomposition and Refinement CO8	Decompose and refine backlog to enable teams to understand better and pick up a portion of the work	CO8A1	Break complex products and projects into independent functional elements that can be completed by one team in one sprint
		CO8A2	Capture and distil emerging requirements and customer feedback
		CO8A3	Ensure that all backlog items are truly ‘ready’ so that they can be pulled by the individual teams

Table 7 Portfolio management activities derived from Scrum@Scale (continued)

		Activities	
Components	*Purpose*	*Code*	*Description*
Release Planning CO9	Provide high-level planning of the entire investment in that single sprint	CO9A1	Forecast delivery of key features and capabilities
		CO9A2	Communicate delivery expectations to stakeholders
		CO9A3	Update prioritisation as needed
Connecting the product owner/scrum master cycles			
Team-level Process CO10	Provide scrum practices as they apply at a single team level	CO10A1	Maximise the flow of completed and quality tested work
		CO10A2	Increase performance of the team over time
		CO10A3	Operate in a way that is sustainable and enriching for the team
		CO10A4	Accelerate the customer feedback loop
Product and Release Feedback CO11	Provide opportunity to reflect and adjust the product backlog as well as the deployment process	CO11A1	Validate assumptions
		CO11A2	Understand how customers use and interact with the project
		CO11A3	Capture ideas for new features and functionality
		CO11A4	Define improvements to existing functionality
		CO11A5	Update progress towards product/project completion to refine release planning and stakeholder alignment
		CO11A6	Identify improvement to deployment methods and mechanism
Metrics and Transparency CO12	Ensure transparency by enabling the organisation to assess, improve and adapt its processes and products	CO12A1	Decide and determine the metrics for both cycles to assess progress, inspect and adapt products and processes
		CO12A2	Measure productivity, value delivery, quality, and sustainability
		CO12A3	Distribute measurement results among decision makers
Scaled structure: scrum of scrums			
Product Owner Team CO13	Ensure that composition and prioritisation of team backlogs and priorities align with the single enterprise backlog and are delivered in alignment with stakeholders	CO13A1	Create an overarching vision for the product and make it visible to the organisation
		CO13A2	Build alignment with key stakeholders to ensure support for implementation of the backlog
		CO13A3	Generate and prioritise a single backlog of unduplicated works
		CO13A4	Refine and decompose larger product backlog items
		CO13A5	Prioritise impediments to ensure that they are resolved

Table 7 Portfolio management activities derived from Scrum@Scale (continued)

		Activities	
Components	*Purpose*	*Code*	*Description*
Product Owner Team CO13		CO13A6	Create a minimal, uniform 'definition of done' that applies to all teams
		CO13A7	Resolve dependencies raised by the teams
		CO13A8	Generate a coordinated release plan (roadmap) and forecast beyond the current release plan
		CO13A9	Decide upon and monitor metrics that give insight into the product and the market
Chief Product Owner (CPO) CO14	Coordinate priorities among multiple product owners and ensure that they align with stakeholders' needs and expectations	CO14A1	Set a strategic vision for the whole scrum of scrums
		CO14A2	Create and prioritise a single backlog of values to be delivered by all of the teams in line with stakeholders' and customers' needs
		CO14A3	Monitor product feedback from customers, as well as product feedback from the scrum of scrums
		CO14A4	Adjust the backlog of value based on feedback
Scrum of Scrums Master (SoSM) CO15	Coordinate and ensure that the joint team effort results in deployments that meet the product owners' expectations	CO15A1	Make progress and an impediment backlog visible to the organisation
		CO15A2	Remove impediments that the teams cannot address themselves
		CO15A3	Deploy a potentially releasable product increment at least every sprint
		CO15A4	Improve the effectiveness of the scrum of scrums
		CO15A5	Prioritise impediments with particular attention to cross-team dependencies and the distribution of backlog

4.3 Extracting relevant activities from SAFe and Scrum@Scale

The data was extracted using components of the conceptual framework developed into a data extraction sheet as the predefined coding categories (deductive) to conduct side-by-side data extraction from the summarised version of the two scaling agile frameworks in Tables 6 and 7. Using an activity fully described as the unit of meaning or coding unit, each activity of SAFe and the Scrum@Scale Guide in the reduced format of these frameworks was thoughtfully read, analysed, and compared with each of the categories in the extraction sheet. When an activity as detailed fit a category as per its purpose, it was highlighted, and the category concerned was noted in the margin. This activity was then copied and pasted in the extraction sheet in Table 5 in a row related to the category to which it was relevant.

During the first appraisal, which aimed at locating data using deductive reasoning, relevant activities were highlighted, and the elements of the conceptual framework addressed were noted in the margin. The second appraisal consisted of processing relevant activities to finalise the content analysis process. The relevant activities

identified were extracted from Tables 6 and 7 and coded in Table 8 according to the element of the conceptual framework they best represented. Given the textual size and number of activities, Table 8 indicates only the notation of each activity, thus leaving out its description.

The data extraction was done framework by framework, starting with SAFe and then the Scrum@Scale Guide. When extracting data (activities) from the Scrum@Scale Guide, besides considering the relevant conceptual framework's components (used here as categories), relevant activities of the Scrum@Scale Guide were compared with those already coded from SAFe under the same category. Whenever similarities were established between a SAFe activity and a Scrum@Scale Guide activity, they were coded on the same row but in their respective column. If there was no similarity, they were coded on a different row. This was done to ensure the inclusivity of the contribution of the SAP approach to the agile conceptual portfolio management framework to be developed. Table 8 presents the results of the extraction process.

Table 8 Relevant activities from SAFe and Scrum@Scale (see online version for colours)

	Conceptual framework elements	*SAFe activities*	*Scrum@Scale activities*	*SAP activities*	*Number of activities*
1	**Strategy formulation and execution**				6
	1.1 Deliberate strategy	DI10A1	CO5A1, CO14A1, CO6A1, CO6A2, CO6A3, CO5A3	SAP111	3
		DI10A3		SAP112	
		DI4A2, DI10A5		SAP113	
	1.2 Emergent strategy	DI8A5, DI4A1		SAP121	3
		DI10A2		SAP122	
		DI10A13, DI5A1		SAP123	
2	**Align the portfolio with the strategy**				
	2.1 Portfolio structuring	DI10A6		SAP211	3
		DI4A1, DI10A4		SAP212	
		DI4A4		SAP213	
	2.2 Portfolio steering	DI2A1		SAP221	1
	2.3 Strategic fit review	DI4A3, DI10A7		SAP232	2
		DI6A5, DI6A6		SAP231	

Table 8 Relevant activities from SAFe and Scrum@Scale (see online version for colours) (continued)

	Conceptual framework elements	*SAFe activities*	*Scrum@Scale activities*	*SAP activities*	*Number of activities*
3	**Maximise the value of the portfolio**				5
	3.1 Component selection				
	3.2 Resource allocation	DI4A5		SAP321	2
			CO5A5	SAP322	
	3.3 Component evaluation	DI6A8		SAP331	3
		DI10A14		SAP332	
			CO12A1, CO12A2, CO12A3	SAP333	
4	**Seek balance in the portfolio**				5
	4.1 Component categorisation				0
	4.2 Component prioritisation	DI6A3	CO1A2, CO5A2, CO7A3, CO7A2, CO13A3	SAP421	2
		DI10A10		SAP422	
	4.3 Portfolio optimisation	DI9A1		SAP431	3
		DI10A15		SAP432	
		DI10A11	CO9A3, CO14A4	SAP433	
		DI6A1, DI6A4			
5	**Pick the right number of components**				3
	5.1 Analysing resource capacity	DI4A10		SAP511	1
	5.2 Quantifying resource demand				0
	5.3 Managing the pipeline	DI1A4, DI10A9, DI2A2		SAP531	2
		DI2A3, DI4A9, DI4A7, DI4A8		SAP532	
6	**Rigorous uncertainty management**				
					0

Table 8 Relevant activities from SAFe and Scrum@Scale (see online version for colours) (continued)

	Conceptual framework elements	*SAFe activities*	*Scrum@Scale activities*	*SAP activities*	*Number of activities*
7	**Portfolio governance**				1
		DI6A10		SAP701	1
8	**Strategic and organisational agility**				4
		DI1A1	CO1A4	SAP801	4
		DI1A2, DI1A3	CO1A1	SAP802	
		DI3A1	CO6A4	SAP803	
		DI3A3, DI3A5	CO5A6, CO5A4	SAP804	
9	**Strategic and organisational learning**				4
		DI7A1		SAP901	4
		DI7A2	CO1A6	SAP902	
		DI7A3	CO1A5	SAP903	
		DI3A4		SAP904	
	Total				34

4.4 Integrating the results of SAFe and Scrum@Scale data extraction

Activities in Table 8 that were similar across SAFe and the Scrum@Scale Guide, were distilled, and the overlaps reduced. These similar activities were analysed, and patterns were scrutinised, leading to their synthesis, decontextualisation and abstraction from the individual framework to provide a more inclusive view by reformulating or rephrasing them. The integration process was handled using the integration rules.

These integrated activities, together with other relevant activities in Table 8, were then grouped into what is considered as the conceptual framework for portfolio management (Tables 9–16). New notations were used to reflect the new context using three digits that represent the framework's main component number, the subcomponent number, and the activity number. This is done for every single activity to shift the focus from a specific context of each scaling agile framework analysed to the inclusive view.

Table 9 Strategy formulation and execution

Code	Description
1.1 Deliberate strategy	
SAP111	Define the enterprise mission, vision and strategy and decide on the budget to invest in the subsequent solutions for the delivery of the strategy with the involvement of key portfolio stakeholders and align the entire organisation along a shared path forward
SAP112	Establish a set of enterprise strategic objectives (strategic themes) to influence the portfolio strategy and provide context for portfolio decision making
SAP113	Define and maintain a portfolio vision and roadmap by defining the portfolio current state and envision the future state, the way to achieve the portfolio's objectives and ultimately the broader enterprise strategy
1.2 Emergent Strategy	
SAP121	Decentralise decision making to allow for the identification of opportunities throughout the course of building solutions, resulting in an innovative riptide to be flown back into solutions' building structures
SAP122	Continuously collaborate, communicate, and align with downstream portfolios to consider resulting emergent strategic properties to respond to a dynamic environment
SAP123	Manage interconnections and dependencies to exploit their resulting opportunities, emerging capabilities and benefits while addressing their challenges

Table 10 Align the portfolio with the strategy

Code	*Description*
2.1 Portfolio structuring	
SAP211	Identify viable strategic options to fill the gap between the current state and the envisioned future state of the portfolio
SAP212	Connect the portfolio to the enterprise strategy using bi-directional processes from strategic objectives (strategic themes), budget and from the portfolio context to ensure portfolio alignment with the enterprise strategy
SAP213	Translate the business vision and strategy into effective technology plans of architectural initiatives that must be adaptively designed using engineering practices
2.2 Portfolio steering	
SAP221	Identify and map operational and developmental value streams to improve business operations and eliminate non-value-creating activities
2.3 Strategic fit review	
SAP231	Periodically review and update the portfolio vision and the portfolio canvas to account for new information, new solutions, mergers and acquisitions and strategic and other changes that can affect the portfolio value streams or solution, the learning taking place, and the dynamism in the business environment
SAP232	Establish metrics and measure the portfolio progress towards meeting the strategic objective, and the portfolio performance to ensure the implementation of the strategy, the alignment of spending and continuous improvement of results

Table 11 Maximise the value of the portfolio

Code	*Description*
3.2 Resource Allocation	
SAP321	Establish lean budgets and guardrails to increase development throughput and fund value streams that are aligned with the strategic themes and business strategy
SAP322	Determine and decide on change to the organisational funding and resource allocation and deployment
3.3 Evaluation	
SAP331	Review value streams, program execution and governance of other portfolio components and investments via a portfolio sync meeting
SAP332	Provide effective financial control over all investments to avoid compromising business benefits by using lean budget
SAP333	Decide and determine the metrics to measure productivity, value delivery, quality, and sustainability to assess progress, inspect and adapt products and processes and share measurement results with decision makers

Table 12 Seek balance in the portfolio

Code	*Description*
4.2 Prioritisation	
SAP421	Collaboratively prioritise portfolio cross-cutting solutions (epics) with participants from different value streams to create a single prioritised list of unduplicated and high-level agile initiatives across the entire agile organisation while considering value creation, risk mitigation and internal dependencies
SAP422	Review and analyse portfolio cross-cutting solutions (epics) to approve, prioritise or reject as a result of a feasibility study through the management of the flow of portfolio cross-cutting solutions
4.3 Optimisation	
SAP431	Pursue relentless planned and ongoing improvement effort via team retrospective, inspect and adapt processes and implement innovative planning iteration to deliver competitive advantage
SAP432	Balance investment in different horizons for better decision making and strategic alignment while taking into consideration growth without neglecting the current performance
SAP433	Periodically review, reprioritise, or update prioritisation as needed, schedule the implementation of the cross-cutting portfolio solutions (epics) within the portfolio backlog and adjust the backlog of value based on feedback

4.5 Revisiting the document analysis process as applied

The process of analysing frameworks for identifying activities relevant to portfolio management as per the conceptual framework was systematically applied. The documents selected for analysis provided, to some extent, a certain number of activities relevant to portfolio management as perceived by the conceptual framework. The results of data reduction and data extraction are quantified in Table 17 to elicit the magnitude of the phenomenon under investigation (Bengtsson, 2016).

The integration of these activities leads to 34 activities being populated into the conceptual framework as the outcome (Tables 9–16). Table 8 makes the entire process of analysing the data transparent as it provides, in code format, the activities as they evolved from the source document to their final format in the conceptual framework, thus enabling their traceability to the source document, and facilitating the verification of the quality of the analysis process (Bengtsson, 2016). The red cells indicate the absolute gap of each current practice used for managing agile portfolio compared to the conceptual framework as developed.

Table 13 Pick the right number of components

Code	*Description*
5.1 Analysing resource capacity	
SAP511	Establish capacity available for new development work vs. ongoing maintenance and support to objectively evaluate and originate portfolio-level initiatives
5.3 Managing the pipeline	
SAP531	Manage, monitor, and control the flow of portfolio cross-cutting solutions (epics) to match demand to capacity, deal with bottlenecks, identify improvement opportunities and continuously improve performance
SAP532	Optimise the flow of portfolio cross-cutting solutions (epics) by limiting the number of significant initiatives in progress to match the portfolio capacity, reducing batch size, and controlling the length of long-term development queues

Table 14 Portfolio governance

Code	*Description*
SAP701	Coordinate continuous audit and compliance with relevant standards, legal and regulatory requirements while overheads are minimised, and the flow of value is supported

Table 15 Strategic and organisational agility

Code	*Description*
SAP801	Build capability within the organisation by developing agile technical and business teams, including training them in lean and agile principles, values, and practices to enable them to reach a level of unprecedented performance and achieve business agility
SAP802	Create an agile working environment, agile operating system and agile HR operations and practices providing working conditions and physical space, corporate operational rules, procedures, and guidelines that enable agility and will render the team productive
SAP803	Sense the market to understand changing market dynamics in order to prepare for and respond to rapidly changing market conditions
SAP804	Determine, decide, and implement changes in the organisational strategy, funding and resource allocation and deployment by creating new cross-cutting solutions and changing the current list of approved solutions to ensure that the execution is constantly realigned with the changing business strategy

Table 16 Strategic and organisational learning

Code	*Description*
SAP901	Invest in and facilitate ongoing growth of employees to develop organisational dynamic transformation capacity necessary to anticipate and exploit opportunities
SAP902	Encourage and support the creation, acquisition and transference of knowledge, modification of practices and exploration of new ways of working to integrate newly acquired insight
SAP903	Create a centre for continuous learning and nurture the intrinsic nature of people to learn, master and harness knowledge in the interest of the organisation
SAP904	Evaluate the results of a strategy using innovation accounting to inform the evolving strategy by measuring specific early economic outcomes that help validate assumptions and increase learning

Table 17 Summary of data reduction and extraction per analysed document

	Standards or frameworks	*Data reduction: number of activities derived*	*Data extraction: number of relevant activities*
1	SAFe	64	45
2	Scrum@Scale	66	24
	TOTAL	130	69

5 Discussion

The document analysis of SAFe and the Scrum@Scale Guide revealed that the two standards base their portfolio management approach on agile values and principles, with the sole purpose of achieving business agility. However, these frameworks differ significantly with each taking a different perspective in building agility in its practices, thus resulting in very few similarities in their activities. While creators of agile frameworks uses similar artefacts to develop their frameworks as observed by Theobald et al. (2019), each one of them tend to make his model as different as possible to ensure uniqueness, possibly with the purpose of making them more appealing and marketable. In this regard, Putta (2018) requests that these frameworks be deeply investigated because of the gap established between what they are being marketed for and what they can actually offer.

SAFe and the Scrum@Scale Guide adhere to the scaling agile view of portfolio management and provide activities that are more aligned with agility in portfolio management practices. Of these, mention should be made of the activities addressing emergent strategy, strategic and organisational agility and strategic and organisational learning. These are important to ensure that an organisation can take advantage of both deliberate and emergent strategy as well as being agile enough with a learning capability to survive in today's complex and fast-changing business environment. Specific mention should be made of SAFe (Leffingwell, 2019) in that it does stresses the need to bridges the gap between strategy formulation and strategy implementation through portfolio management. However if fails to provide specific activities to undertake as was intended in the conceptual framework.

While the conceptual framework encompasses a significant number of activities from both SAFe investigated, these frameworks have considerable gaps in addressing the management of portfolios. Entire components of the conceptual framework such as Rigorous Management of Uncertainties, including subcomponents such as Portfolio Component Selection, Component Categorisation, Quantification of Resource Demand had no relevant activities from these two scaling agile frameworks. According to Bowen (2009) the existence of such gaps indicates that the subject of the investigation has not been appropriately addressed. By not making provision for the management of uncertainty, SAFe drive agility while opening up organisations to risks that might compromise the overall effort of achieving business agility. This is a clear indication that scaling agile frameworks should not be used to fill the APM gap effectively.

It is also important to clarify that between the two frameworks, the Scrum@Scale Guide has the least relevance to portfolio management. This can be since it relies on the practices of small and collocated scrum team models which happened to be scaled up to address the need for coordinating multiple teams to deal with dependency among them and the duplication of work. These limits in portfolio activities not only indicate that Scrum@Scale is more appropriate for large solutions than portfolios, but also justify why SAFe has dominated the industry even though both focus on scaling agile.

SAFe, which has relevant activities related to emergent strategy, fails to connect the emerging strategic patterns to strategy formulation to the point of modifying the existing strategy. Within the provision of SAFe, emerging strategic patterns can result in new cross-cutting solutions that are integrated into the portfolio but does not go as far as changing the current organisational strategy. This can be attributed to the fact that SAFe, like many of the SAFe, enforces a top-down perspective in strategy formulation and implementation.

6 Limitations

The framework has not stood the test of its practicability in the industry. Considering that it takes years for an organisation to realise its strategy and reach the defined organisation of the future state, a longitudinal study is needed to establish how organisations that are using the framework have performed or succeeded in achieving the results. The study can further examine how the implementation of the framework has occurred in legacy organisations that are still traditional based.

The framework was developed from an activity-centric view, omitting the people-centric view. This leaves room for individual organisations which might assign responsibilities and accountability to these activities in a way that affects the efficiency and effectiveness of the task, and the entire portfolio's ability to deliver on its mandate. Considering the portfolio framework from both a people- and activity-centric perspective might be more beneficial rather than just the activities and their related ceremonies.

The developed framework is broad and therefore cannot be used as a one-size-fits-all solution or as a panacea. The flexibility, agility and learning that it emphasises should also be applied to its own implementation by taking into consideration aspects such as the organisational context, size, the extent of investment and the volume of portfolio management activities, to name but a few.

7 Conclusion

This paper assessed the relevance of scaled agile practices to portfolio management in a dynamic environment. It develops a conceptual framework for portfolio management in a dynamic and complex environment and uses the framework to identify activities relevant to portfolio management from scaled agile practices. The framework provides unambiguous and specific activities describing what to do to manage a portfolio in a dynamic environment successfully, without getting lost in unnecessary details and duplications, and being carried by the flow of a specific framework rather than the actual work. It provides a blended framework that can ensure the successful delivery of results (Papadakis and Tsironis, 2018).

The findings suggest that the current scaled APM practices have gaps in addressing the management of portfolios in today fast changing and complex environment, in a way that might probably assist organisations not only implement their deliberate strategy, but also take advantage of emerging strategies, while managing their risks. Scaling agile frameworks, while being effective for large solutions, do not fit or cover efficiently the sphere of portfolio management. They have numerous gaps (Putta, 2018), create more problems for portfolio management (Stettina and Hörz, 2015) and lack empirical evaluation (Ahmad et al., 2017).

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